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Geology of the
Hill Lake Area
District of Timiskaming

by G.W. Johns

THIS PROJECT IS A COMPONENT OF THE NORTHERN ONTARIO GEOLOGICAL SURVEY (NOGS) PROGRAM.

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Foreword

Detailed geological mapping of the Hill Lake Area was undertaken by the Ontario Geological Survey, Ontario Ministry of Natural Resources, on behalf of the Ministry of Northern Development and Mines. This mapping project was designed to encourage exploration interest in, and to provide a mineral potential evaluation and planning base for the area.

Gold mineralization is common within the Hill Lake Area and is associated with porphyry intrusions and fuchsite-carbonate schists. The Nipissing Diabase hosts carbonate-apatite veins and dikes that contain silver and copper mineralization. Copper is also found in shear zones.

V.G. Milne
Director
Ontario Geological Survey

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GEOLOGICAL MAP (BACK POCKET)

Map 2501 (coloured)—Hill Lake Area District of Timiskaming,
Scale 1:31 680 of 1 inch to 1/2 mile.

CONVERSION FACTORS FOR MEASUREMENTS IN ONTARIO GEOLOGICAL SURVEY PUBLICATIONS

If the reader wishes to convert imperial units to SI (metric) units or SI units to imperial units the following multipliers should be used:

CONVERSION FROM SI TO IMPERIAL			CONVERSION FROM IMPERIAL TO SI		
SI Unit	*Multiplied by*	*Gives*	*Imperial Unit*	*Multiplied by*	*Gives*
			LENGTH		
1 mm	0.039 37	inches	1 inch	**25.4**	mm
1 cm	0.393 70	inches	1 inch	**2.54**	cm
1 m	3.280 84	feet	1 foot	**0.304 8**	m
1 m	0.049 709 7	chains	1 chain	20.116 8	m
1 km	0.621 371	miles (statute)	1 mile (statute)	**1.609 344**	km
			AREA		
1 cm^2	0.155 0	square inches	1 square inch	**6.451 6**	cm^2
1 m^2	10.763 9	square feet	1 square foot	**0.092 903 04**	m^2
1 km^2	0.386 10	square miles	1 square mile	2.589 988	km^2
1 ha	2.471 054	acres	1 acre	0.404 685 6	ha
			VOLUME		
1 cm^3	0.061 02	cubic inches	1 cubic inch	**16.387 064**	cm^3
1 m^3	35.314 7	cubic feet	1 cubic foot	0.028 316 85	m^3
1 m^3	1.308 0	cubic yards	1 cubic yard	0.764 555	m^3
			CAPACITY		
1 L	1.759 755	pints	1 pint	0.568 261	L
1 L	0.879 877	quarts	1 quart	1.136 522	L
1 L	0.219 969	gallons	1 gallon	**4.546 090**	L
			MASS		
1 g	0.035 273 96	ounces (avdp)	1 ounce (avdp)	28.349 523	g
1 g	0.032 150 75	ounces (troy)	1 ounce (troy)	**31.103 476 8**	g
1 kg	2.204 62	pounds (avdp)	1 pound (avdp)	**0.453 592 37**	kg
1 kg	0.001 102 3	tons (short)	1 ton (short)	**907.184 74**	kg
1 t	1.102 311	tons (short)	1 ton (short)	**0.907 184 74**	t
1 kg	0.000 984 21	tons (long)	1 ton (long)	**1016.046 908 8**	kg
1 t	0.984 206 5	tons (long)	1 ton (long)	**1.016 046 908 8**	t
			CONCENTRATION		
1 g/t	0.029 166 6	ounce (troy)/ ton (short)	1 ounce (troy)/ ton (short)	34.285 714 2	g/t
1 g/t	0.583 333 33	pennyweights/ ton (short)	1 pennyweight/ ton (short)	1.714 285 7	g/t

OTHER USEFUL CONVERSION FACTORS

1 ounce (troy)/ton (short)	20.0	pennyweights/ton (short)
1 pennyweight/ton (short)	0.05	ounce (troy)/ton (short)

NOTE–Conversion factors which are in bold type are exact. The conversion factors have been taken from or have been derived from factors given in the Metric Practice Guide for the Canadian Mining and Metallurgical Industries published by The Mining Association of Canada in co-operation with the Coal Association of Canada.

Geology of the Hill Lake Area District of Timiskaming

by
G.W. Johns

Geologist, Precambrian Section, Ontario Geological Survey, Ministry of Northern Development and Mines.

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Abstract

The Hill Lake map area covers 483 km^2, and lies between the towns of Englehart and Elk Lake in the District of Timiskaming. The townships of Dack, Beauchamp, Robillard, Bryce, Tudhope, and part of Truax Township are underlain by Early Precambrian metavolcanics of the Abitibi Greenstone Belt that have been unconformably overlain by the sedimentary rocks of the Cobalt Group, part of the Huronian Supergroup which is Middle Precambrian in age.

The metavolcanics are subdivided into three groups which are from the oldest to the youngest: the Wabewawa Group, the Catharine Group, and the Skead Group. These groups form a southeast-facing homoclinal sequence approximately 11 000 m thick. The Wabewawa Group, composed of interbedded high magnesium tholeiitic basalt, high iron tholeiitic basalt, komatiitic basalt and ultramafic flows, is 1800 to 3000 m thick. The Catharine Group is 4400 m thick, conformably overlies the Wabewawa Group, and consists of high iron tholeiitic basalt. The Skead Group, 4480 m thick, is composed of interdigitated to graded, calc-alkalic andesitic to dacitic quartz-feldspar porphyry, pyroclastic breccia, tuff-breccia, lapilli-tuff, lapillistone and tuff, and conformably overlies the Catharine Group.

Various intrusions are associated with the metavolcanic groups. The Wabewawa Group has been intruded by small, localized gabbros and a layered ultramafic sill situated at Charlton. The Skead Group, in Bryce and Tudhope Townships, has many diverse intermediate and felsic porphyries associated with it. The largest, the Britcanna Porphyry, is located between the Catharine and the Skead Groups. Smaller dikes and irregularly-shaped bodies of these porphyries are also scattered throughout the Catharine and Skead Groups in Bryce and Tudhope Townships. In Dack and Beauchamp Townships, the Skead Group has been intruded by thin gabbro sills and a pyroxene-feldspar diorite.

The Round Lake Batholith, composed of foliated to cataclastic tonalite to trondhjemite and the younger granodioritic Hope Lake Stock, have intruded the base of the Wabewawa Group east of the Cross Lake Fault and the base of the Catharine Group west of the fault. Fine-grained pebble-bearing and nonpebble-

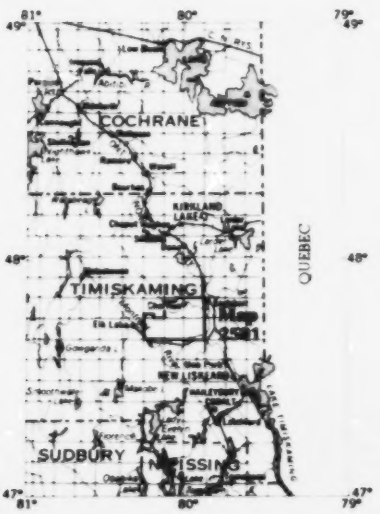

Figure 1. *Key map showing the location of the Hill Lake Area. Scale 1:3 168 000 (1 inch to 50 miles).*

bearing lamprophyre dikes have intruded the metavolcanics and the Round Lake Batholith. Diabase dikes were the last intrusive rocks emplaced during the Early Precambrian.

Unconformably overlying the Early Precambrian rocks, are the gently dipping, unmetamorphosed sedimentary rocks of the Middle Precambrian Cobalt Group of the Huronian Supergroup. The basal Gowganda Formation is composed of conglomerate, argillite, arenite, and wacke. The overlying Lorrain Formation is composed of moderately sorted feldspathic arenite containing pebble conglomerate lenses. Both the Early and Middle Precambrian Rocks have been intruded by Nipissing Diabase sills.

Faults, shear zones, and lineaments which are Early Precambrian in age trend northwest to northeast. Regional, northwest-trending faults associated with the Lake Timiskaming Rift Valley are Middle Precambrian in age.

Gold showings are common within the map area, and are associated with the porphyry intrusions in Bryce and Tudhope Townships and the fuchsite carbonate schists in Dack Township. Silver and copper are associated with carbonate-aplite veins and dike complexes found in the Nipissing Diabase in Tudhope Township. Copper is also found in the shear zones located in Tudhope and Bryce Townships.

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Introduction

The Hill Lake area consists of 483 km^2, and is located between the towns of Englehart and Elk Lake in the District of Timiskaming. The area is bounded by Latitudes 47°40'00"N to 47°50'30"N, and Longitudes 80°17'00"W to 80°16'30"W and it constitutes the townships of Dack, Beauchamp, Robillard, Bryce, Tudhope, and the southern part of Truax Township. The approximate centre of the map area is the Ontario Ministry of Natural Resources fish rearing station at Hill Lake, 16 km southwest of the town of Englehart. The area is in the Larder Lake Mining Division.

Access

Highway 560 from Englehart to Elk Lake crosses the northern part of the map area. Highway 65 from New Liskeard to Elk Lake crosses the southwestern corner of Tudhope Township. Most of the map area is easily accessible by road; the only exception being that of Tudhope Township. Gravelled township roads along lot and concession lines provide access to the outcrop areas in Dack, Beauchamp, and Robillard Townships.

The north-central part of Bryce Township may be reached by a gravel/clay road running west of the Ontario Ministry of Natural Resources fish rearing station at Hill Lake. The southern part of Bryce Township can be reached by driving north on a gravel road from Osseo on Highway 65 and by a gravel road that runs north of Mountain Chutes on Highway 65.

The lack of arable land and marketable timber has precluded the development of roads in Tudhope Township. Highway 560 is found along the northern township line, and Highway 65 crosses the southwestern corner of the township. Except for these two highways, a road into the Northern Silver Fox Resources Incorporated (Silver Jackpot Deposit) (36) (*see* Map 2501, back pocket) property and a road into an abandoned gravel pit in the south-central part of the township, the rest of the township is only accessible by foot or helicopter.

Topography and Drainage

The Hill Lake area may be divided into three physiographic regions: the outcrop area, the clay belt area, and the Hill Lake Moraine. Most of the outcrops are found in the western half of the map area; exposures of bedrock are also found in a northeast-trending linear zone in northern Beauchamp and southern Dack Townships and are scattered in the northeastern part of the area. The clay belt lies east of the Cross Lake Fault and between the Hill Lake Moraine and the outcrop area in Bryce Township west of the Cross Lake Fault. The Hill Lake Moraine runs southeast of Hill Lake beyond the map area.

The western outcrop area has moderate rolling relief with an average elevation of 303 m above sea level. The areas underlain by Nipissing Diabase are more resistant to erosion and tend to have more a rugged relief forming higher hills. The diabase ridge in southern Bryce Township is steep sided, with maximum elevation of 364 m. The central part of Tudhope Township is topographically lower than the surrounding outcrop area, contains very little outcrop, and is very swampy. The linear zone of outcrops in Beauchamp and Dack Townships consists of steep sided rock knolls surrounded by sand or clay. The highest point in this area is associated with a Nipissing Diabase sill and is 351 m above sea level. In northeastern Dack Township low flat outcrops protrude through the clay. Both the Cross Lake Fault and the northwest-trending fault at Englehart form steep sided scarps; both with about 46 m difference in elevation.

The areas underlain by the varved clay of the "Little Clay Belt" are flat and deeply incised by rivers and streams. The average elevation for this area is 273 to 288 m above mean sea level.

This land, for the most part, is cultivated.

The Hill Lake Moraine is found along the Cross Lake Fault in Bryce and Beauchamp Townships. It has a hummocky topography with many kettle-like depressions and lakes within its central part. Elevations of this moraine vary from 273 to 318 m above mean sea level.

There are many streams in the area which drain into either the Montreal River or the Englehart River, both of which eventually flow into Lake Timiskaming.

Previous Geological Investigations

Geological investigations carried out in the map area and surrounding areas have been reported on in the past. In 1907, Knight (1908) examined the Elk Lake area and reported on the potential for silver mineralization. Burrows and Hopkins (1922) completed reconnaissance mapping in the Blanche River area which included the townships of Robillard, Bryce, Dack, and Beauchamp. The first detailed survey of the current map area was carried out by Moorhouse (1944) in 1940 when he mapped Tudhope, Bryce, Dack, and Beauchamp Townships and reported on the gold properties in the area. In 1961, Grant (1963) mapped Catharine and Marter Townships northeast of the current map area. In 1962, Thomson (1966) mapped Henwood Township, due south of Beauchamp Township. The Elk Lake silver area adjoining Tudhope Township on the west was mapped in detail in 1963 and in 1964 by Mackean (1968). The area adjacent to Dack and Beauchamp Townships on the east was mapped in 1971 by Lovell (1977).

Geological studies are currently being carried out in parts of the map area. Jensen (1978b, 1979, 1980), of the Ontario Geological Survey, has been researching the stratigraphy of the metavolcanics. Jean Lafleur, University of Ottawa, is studying the Round Lake Batholith and its relationship with the metavolcanics that it intrudes (Lafleur and Hogarth 1981).

Present Geological Survey

Field work for this report was undertaken between May 12 and August 27, 1980. The crew consisted of the author, two senior assistants, and five junior assistants.

Mapping was done using air photographs at a scale of 1:15 840 (1 inch to 1/4 mile) which had been taken in 1970 and had been provided by the Air Photo Library, Ontario Ministry of Natural Resources. Outcrops observed on the air photographs were reached using the pace and compass method of traversing. The observed outcrop geology, outcrop boundaries, and interpreted lineaments were plotted in the field on acetate overlays to the air photographs. The data were then transferred to cronaflex base maps prepared by the Cartographic Section, Surveys and Mapping Branch, Lands and Waters Group, Ontario Ministry of Natural Resources, at a scale of 1:15 840 (1 inch to 1/4 mile). The base map was prepared from Forest Resources Inventory maps at a scale of 1:15 840 (1 inch to 1/4 mile) of the Timber Branch of the Ministry of Natural Resources. Geology is not tied to surveyed lines.

The geology in areas without rock exposure was interpreted using the Geological Survey of Canada Aeromagnetic Series maps at a scale of 1:63 360 (1 inch to 1 mile) (Geological Survey of Canada 1965a, 1965b, 1965c, 1965d, 1965e).

Acknowledgments

The author was assisted in the field by J. Duhaime, D. Eliopoulos, D.J. Good, T.A. Haber-Corrigan, W.R. Hoyle, I.M. Lowe-Wylde, and N.H. Maerz. The senior assistants, D.J. Good and W.R. Hoyle, mapped more than 50 percent of the area.

The help and co-operation of the staff of the Ontario Ministry of Natural Resources Field Office in Elk Lake was appreciated and is gratefully acknowledged. The hospitality provided by René and Jean Pelissier and family made the crew feel at home and made the field season enjoyable.

Prospecting and Mining Activity

Silver was discovered at Cobalt in 1903. Subsequent prospecting expanded from there and, by 1907, the region around Elk Lake was being actively prospected for silver. Knight (1908) described some of the properties and mineralization found in the vicinity of Elk Lake. Some work had been carried out on gold prospects in southwestern Bryce Township after the exploration for silver waned (Burrows and

Hopkins 1922), but this was of a modest nature. Active prospecting for gold in eastern Tudhope and western Bryce Townships did not occur until the late 1920s. This was followed by a lull in prospecting until 1934 when gold was discovered on the Donna Marchese Property (Estival Property) (25) in Bryce Township (Moorhouse 1944). (The number in parentheses refers to number in list of properties and mineral deposits listed on Map 2501, back pocket.) In the following years, the exploration on the G. Gereghty Property (Britcanna Prospect) (12 in Bryce Township), the Gossan Resources Limited Property (Libby Prospect) (15 in Bryce Township), and many others resulted in considerable activity in the area. In 1937 and 1938, interest in the area lagged, and by 1940, very little prospecting was being carried out.

Exploration for gold by individuals has been sporadic throughout the area since 1940. There was increased interest in the gold potential in the early 1950s, early and mid 1960s, and early and mid 1970s. At these times, various companies and syndicates have optioned and explored the best known gold showings using geophysical methods, geological methods, and diamond drilling (Assessment Files Research Office, Ontario Geological Survey, Toronto, and Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake).

Currently, Northern Silver Fox Resources Incorporated is undertaking underground exploration and development on the old Silver Jackpot Mine (36 in Tudhope Township). In addition to the existing underground work, extensive stripping and trenching, as well as diamond drilling have been completed. In Bryce Township exploration for gold is once again active. Gossan Resources Limited is planning an exploration program on the Libby Prospect (15 in Bryce Township) which includes ground geophysics and diamond drilling (James Campbell, President, Gossan Resources Limited, personal communication, 1981). Petromet Resources Limited (40 in Bryce Township) has acquired ground north and west of Honeymoon Lake. G. Gereghty staked the Britcanna Prospect (12 in Bryce Township) in 1980. A. Mowat has staked and is prospecting the Hillcrest Property (34 in Dack Township) in Dack Township.

Many of the old claims in Tudhope, Bryce, and Robillard Townships have been patented or leased.

General Geology

The Hill Lake map area is located on the northeastern corner of the Cobalt Embayment (Card *et al.* 1972) at the southern limits of the exposed Abitibi Greenstone Belt (Pyke *et al.* 1973). Rocks exposed in the map area consist of Early Precambrian ultramafic metavolcanics, pillowed and massive mafic flows, intermediate to felsic pyroclastic rocks and intrusions which have been intruded by foliated tonalite to trondhjemite. Sedimentary rocks of the Middle Precambrian Cobalt Group unconformably overlie these igneous rocks. Both the Early and Middle Precambrian rocks have been intruded by Nipissing Diabase sills.

Jensen (1978b, 1979) has divided the Early Precambrian metavolcanics in the Kirkland Lake-Larder Lake area into groups. It is possible to subdivide the metavolcanics found in the Hill Lake area into similar groups.

In Dack Township, the lowest group has an exposed thickness of 1800 to 3000 m; the basal part has been intruded by the Round Lake Batholith. The rocks of this group consist of dark green, fine-grained, pillowed mafic flows; massive, medium-grained flows; and thin ultramafic flows and intrusions. Minor intermediate tuffs were noted. Near Charlton is a sequence of highly altered mafic and ultramafic flows and massive mafic flows intruded by aplite dikes. This group is similar to Jensen's (1978b) Wabewawa Group.

Overlying the Wabewawa Group in Dack Township is a sequence, 4400 m thick, composed of fine-grained, pillowed mafic flows, interbedded with fine-grained, black, featureless mafic flows with intermediate pyroclastic rocks occurring at the top. These rocks are similar to those described as the Catharine Group (Jensen 1978b). In Tudhope, Bryce, and Robillard Townships, the base of this group has been intruded by the Round Lake Batholith.

Conformably overlying the Catharine Group is a sequence of intermediate to felsic calc-alkalic pyroclastic rocks with an exposed thickness of at least 4480 m. These rocks vary laterally from a chaotic, unsorted, assemblage of pyroclastic breccia, tuff-breccia, lapilli-tuff, and tuff in Bryce and Tudhope Townships to a better sorted, bedded sequence of lapilli-tuff, tuff, lapillistone, and pyroclastic breccia in Beauchamp and Dack Townships. Minor mafic flows are interbedded with the pyroclastic rocks in the upper part of the sequence. Jensen (1978b) assigned rocks similar to these to the Skead Group. A volcanic vent might be located in the vicinity of Heather Lake in Bryce Township as is suggested by the exposures of very coarse, unsorted, pyroclastic breccia there. Immediately below this pyroclastic breccia is an irregularly-shaped sill of massive, fine-grained quartz-feldspar porphyry that may be a subvolcanic intrusion interpreted as a magma chamber.

In Bryce Township, an oval, 5.6 km^2, hypabyssal, feldspar porphyry has been emplaced between the Catharine and Skead Groups. Many diverse dikes of intermediate composition are also found intruding the metavolcanics.

The metavolcanic sequences have been intruded by the Round Lake Batholith. These rocks are predominantly medium-grained, grey to pink, foliated hornblende tonalite, trondhjemite, and granodiorite. The contact is intrusive, except at the northeastern corner of Dack Township, where the batholith is in fault contact with the metavolcanics.

Narrow, fine-grained lamprophyre dikes intrude the Round Lake Batholith and the metavolcanic sequences. Unmetamorphosed Early Precambrian diabase dikes intrude the Round Lake Batholith and the metavolcanics.

Sedimentary rocks of the Middle Precambrian Cobalt Group of the Huronian Supergroup unconformably overlie the Early Precambrian metavolcanics and intrusive rocks. Moderately sorted Gowganda Formation conglomerate occurs in northwestern Tudhope and southwestern Truax Townships. Central Tudhope Township, southern and eastern Bryce Township, southeastern Dack Township, and most of Beauchamp Townships are underlain by gently dipping, moderately sorted, pebble to cobble conglomerate, arenite, and thinly laminated grey-green and red argillite of the Gowganda Formation. This is overlain by the Lorrain Formation consisting of medium-grained, moderate to well sorted, feldspathic arenite with thin lenses of pebble conglomerate.

TABLE 1. TABLE OF LITHOLOGIC UNITS FOR THE HILL LAKE AREA.

PHANEROZOIC

CENOZOIC

QUATERNARY

PLEISTOCENE AND RECENT
Glacial, glaciofluvial, swamp, lake and stream deposits.

Unconformity

PRECAMBRIAN

MIDDLE PRECAMBRIAN

MAFIC INTRUSIVE ROCKS

NIPISSING DIABASE
Diabase, diabase-chilled margins, aplite, and granophyre.

Intrusive Contact

HURONIAN SUPERGROUP

COBALT GROUP

LORRAIN FORMATION
Feldspathic arenite, grit to pebble conglomerate, and breccia dike.

Conformable Contact

GOWGANDA FORMATION
Matrix-supported conglomerate, clast-supported conglomerate, mudstone and wacke, green-grey argillite, feldspathic lithic arenite, wacke.

Unconformity

EARLY PRECAMBRIAN

UNMETAMORPHOSED MAFIC INTRUSIVE ROCKS
Diabase, porphyritic diabase.

Intrusive Contact

MAFIC ALKALIC INTRUSIVE ROCKS
Lamprophyre, pebble-bearing lamprophyre.

Intrusive Contact

FELSIC TO INTERMEDIATE INTRUSIVE ROCKS
Tonalite, trondhjemite, granodiorite, aplite, cataclastic tonalite, contaminated tonalite to diorite, tonalite with mafic xenoliths, mylonite.

Intrusive Contact

METAMORPHOSED FELSIC TO INTERMEDIATE INTRUSIVE ROCKS
Quartz porphyry, feldspar porphyry, quartz-feldspar porphyry, felsite.

Intrusive Contact

METAMORPHOSED MAFIC INTRUSIVE ROCKS
Hypersthene diorite, gabbro, porphyritic gabbro, hornblende gabbro, diabase.

Intrusive Contact

CHARLTON ULTRAMAFIC INTRUSION
Wehrlite, pyroxenite, leucocratic gabbronorite, variolitic mafic dike.

Intrusive Contact

METASEDIMENTS

CHEMICAL METASEDIMENTS
Chert, very fine grained felsic tuff.

METAVOLCANICS

ULTRAMAFIC METAVOLCANICS
Peridotite, talc-carbonate schist, chlorite schist.

INTERMEDIATE TO FELSIC METAVOLCANICS
Flows, quartz-feldspar porphyry, tuff, lapilli-tuff, lapillistone, tuff-breccia, pyroclastic breccia.

MAFIC METAVOLCANICS
Flows, pillowed flows, amygdaloidal flows, variolitic flows, black high iron flows, broken pillow breccia, isolated pillow breccia, flow breccia, porphyritic flows, amphibolite.

Both the Early and Middle Precambrian rocks have been intruded by an undulatory sill of Nipissing Diabase which has been dated at 2150 Ma (Van Schmus 1965; Fairbairn *et al.* 1969). The Early Precambrian metavolcanics have been affected by low temperature burial metamorphism (Winkler 1967). Rocks containing pumpellyite as well as epidote are found in Beauchamp and southern Dack Townships. Near the Round Lake Batholith, because of low pressure contact metamorphism, these rocks are transformed to actinolite-tremolite-epidote-bearing metavolcanics. Schistose, hornblende-bearing amphibolite facies rocks were observed next to the Round Lake Batholith in Tudhope, Bryce, Robillard, and Dack Townships.

The Middle Precambrian sedimentary rocks, except for the contact zone with the Nipissing Diabase, have not been affected by metamorphic processes.

PRECAMBRIAN

EARLY PRECAMBRIAN

Metavolcanics

The metavolcanics have been classified on the basis of colour index, texture, and primary mineralogy into a three-fold classification of ultramafic flows, and intrusions; mafic flows; and intermediate to felsic pyroclastic rocks. The metavolcanics have been subdivided into three stratigraphic groups. The mafic and ultramafic

metavolcanics are found as high iron and high magnesium tholeiitic and komatiitic flows and breccias in the Wabewawa and Catharine Groups. Calc-alkalic intermediate to felsic pyroclastic rocks are found primarily within the Skead Group.

Mafic Metavolcanic Flows

The mafic metavolcanic sequences contain massive, fine-grained flows, massive medium-grained flows, pillowed and amygdaloidal flows, variolitic flows, high iron spinifex and massive textured flows, broken and isolated pillow breccias, porphyritic flows, and amphibolite. Mafic metavolcanics of komatiitic and tholeiitic affinities are found in the Wabewawa, Catharine, and Skead Groups.

Pillowed amygdaloidal flows, the most abundant mafic rock type, are found interbedded with the massive, fine- and medium-grained flows in Dack, Robillard, Bryce, and Tudhope Townships, and are also interbedded with the base of the Skead Group pyroclastic rocks. Individual flow thicknesses were not generally discernable, but northwest of Trestle Hill in Dack Township, individual pillowed flows ranging in thickness from 2 to 7 m were noted, and 7 to 12 m thick flows were also observed in southeastern Dack Township.

The nature of the pillowed flows depends on the degree of alteration and metamorphism which has affected the rocks. The unaltered flows, which occur interbedded with the Skead Group pyroclastic rocks, are dark grey to grey-green with a light coloured weathered rind. The pillowed flows containing actinolite/tremolite have a pale grey-green fresh surface and a light coloured weathered rind. The hornblende-bearing rocks have a dark green fresh surface and a brownish coloured weathered rind.

Pillows are generally well formed with ellipsoidal and cuspate shapes. The average size of the pillows is 50 cm by 20 to 30 cm with the maximum size in the range of 1.5 m by 90 cm and the minimum sizes are 20 to 30 cm by 15 to 20 cm. Selvage thickness is relatively constant at 2 to 3 cm with the maximum and minimum thicknesses being 5 cm and 1 to 2 cm, respectively. The selvages are less resistant to weathering, and contain fine-grained rock powder, hyaloclastite, or chert. Northwest of Trestle Hill in Dack Township, there are some "pillow forms" that have a concentric-ridged appearance to them and these may be pahoehoe toes. Macdonald (1972, p.77) showed an example of pahoehoe toes with a similar concentric ridged appearance. Pillows have a smooth, weathered surface that may have rare radiating fractures. In Bryce Township, south of Reed Lake, some pillow cores are totally altered to pale green epidote.

Amygdules are found associated with both pillowed flows and massive, fine-grained flows. Amygdules are generally restricted to the rims of pillows, but some larger amygdules are found in the cores of pillows. The amygdules, located around the rims of pillows, are in the 1 to 3 mm size range, and can be as much as 5 mm in the cores of pillows. The fine-grained massive flows have both spherical and irregularly-shaped amygdules. Spherical shaped amygdules range in size from 1 to 3 mm down to less than 0.5 mm, while the irregularly-shaped amygdules are seen only in thin section and are less than 0.5 mm. The amygdules are filled with, in decreasing order of abundance, carbonate, chlorite, quartz, and prehnite-pumpellyite.

Pillowed and amygdaloidal flows are fine-grained, holocrystalline to hypocrystalline rocks. In fresh samples of the pillowed flows that are interbedded with the intermediate to felsic pyroclastic rocks of the Skead Group, the mineralogy is primary. This consists of euhedral oligoclase laths, subhedral to euhedral augite, and carbonate-filled amygdules. Basaltic glass found in the lesser metamorphosed flows has been altered to very fine grained epidote and chlorite. Amygdules are filled with cryptocrystalline chlorite or carbonate, and may be rimmed with prehnite, pumpellyite, or quartz. Commonly, the pyroxenes have been altered to actinolite/tremolite pseudomorphs. In the fine-grained, foliated and very fine grained massive flows, the tremolite/actinolite occurs as fibrous crystals defining foliation or randomly oriented crystals replacing "glassy" groundmass or fragments. Epidote occurs as anhedral grains disrupting foliation, as very fine grained masses and aggregates in the groundmass, or at the top of the Catharine Group in

Dack Township, replacing the plagioclase in an epidotized flow. Chlorite is ubiquitous as interstitial masses, amorphous masses within the groundmass, amygdule fillings, and replaces glassy fragments. Feldspar laths are either untwinned or strongly saussuritized making the determination of plagioclase composition difficult.

Broken pillow breccias and isolated pillow breccias are associated with the pillowed lavas, and are less commonly associated with the massive lavas. Definitions of these types of pillow breccias are after Carlisle (1963, p.49-50). In the context of this report, isolated pillow breccia contains irregularly shaped, unbroken pillows that are separated by a hyaloclastite matrix. Broken pillow breccia consists of disaggregated fragments of pillows set in a hyaloclastite matrix. Both pillow breccia types either sharply overlie or grade down into the unbroken lava. Accumulations of the broken pillow breccia are 3 to 4 m thick and the isolated pillow breccia is up to 15 m thick. Gradation from isolated pillow breccia to broken pillow breccia was observed in Dack Township northwest of Englehart.

In the isolated pillow breccia, amoeboid-shaped pillows having chilled margins range in size from 10 to 20 cm by 3 to 4 cm to 5 to 10 cm by 2 to 5 cm. The pillow fragments in the broken pillow breccia are angular, do not exhibit a continuous chill margin, and are commonly 4 to 6 cm in size. The hyaloclastite matrix of both pillow breccia types consists of fine- to medium-grained glass shards, pillow fragments, and rock fragments. The glass having both a globular and fragmental nature has been altered to chlorite or tremolite/actinolite. The pillow and rock fragments within the hyaloclastite exhibit chilled margins and have been either totally or partly altered to epidote. The very fine grained rock fragments or glass have been altered to an aggregate of epidote, chlorite, carbonate, and quartz.

Massive, fine- and medium-grained flows occur throughout the mafic metavolcanics of the Wabewawa and Catharine Groups. The fine-grained flows are equigranular with grain sizes less than 1 mm and the medium-grained flows are generally inequigranular with grain sizes in the range of 1 to 5 mm. Foliation is better developed in the fine-grained flows than the medium-grained flows which appear more massive. A fresh surface ranges from dark grey-green to dark green and the weathered surface is brownish coloured.

In Bryce and Robillard Townships, pale epidote pods and veins are seen throughout the fine-grained flows. These isolated monomineralic groupings are not as common in the medium-grained flows.

In the vicinity of the little pond 1500 m north of Honeymoon Lake along the township line, a fine-grained, xenolith-bearing, mafic flow was observed. The xenoliths make up approximately 5 percent of the rock and are found in a 5 to 6 m thick layer within the flow. The xenoliths are composed of rounded intermediate to felsic, fine-grained tuffaceous material which exhibits strongly resorbed rims. These zenoliths range in size from less than 1 cm to 5 to 6 cm.

The medium-grained massive flows are generally inequigranular, and in some cases contain amphibole phenocrysts. In Bryce Township, these porphyritic flows are located 800 to 1000 m north of the western side of the feldspar porphyry plug. Because the amphiboles are more resistant to weathering, they have an irregular clotty weathered surface.

The mineralogy and alteration of the fine-grained massive flows is similar to that described for the pillowed flows. As the Round Lake Batholith is approached, chlorite and chlorite + epidote supersede tremolite/actinolite.

Remnants of flow breccia occur as isolated, irregularly shaped pods containing angular, clast-supported blocks of flow material. The fragments range in size from less than 10 cm to 30 cm. Variolitic mafic flows are not commonly seen and were only noted within the Catharine Group in Bryce and Tudhope Townships. The best exposure is along the southern edge of the feldspar porphyry plug in Bryce Township. Concentric ringed, ovoid features or varioles up to 7 cm are concentrated along flow patterns in the rock.

Some of the high iron mafic metavolcanic flows could be subdivided from the tholeiitic flows by appearance, and they occur in the Wabewawa and Catharine

Groups in Dack Township. These flows are magnetic and are generally very dark green to black on fresh surfaces and dark brown on weathered surfaces. Grain size varies from being medium grained to very fine grained. The flow, found just below the ultramafic top of the Wabewawa Group, is approximately 100 m thick and contains a massive, medium-grained base that grades up into a 1.6 m thick pyroxene spinifex-textured top. This spinifex-textured top is banded with blades of pyroxene crystals 6 cm long at the base and smaller blades at the top. Sub-radiating crystals of hornblende occur in the medium-grained base. The high iron flows that are found striking through Horseshoe Falls and Hell's Gate on the Englehart River in Dack Township are fine grained and have a friable weathered nature. Less friable samples exhibit fine-grained, radiating crystal textures. These flows are holocrystalline and hypocrystalline and contain, depending on the degree of alteration, augite, hypersthene, feldspar, hornblende, actinolite, chlorite, sericite, epidote, carbonate, magnetite, leucoxene, and stilpnomelane.

Pyroxene crystals and granular interstitial aggregates of pyroxene are found as primary minerals; pseudomorphs composed of hornblende and actinolite occur. Augite occurs as subhedral to anhedral crystals and hypersthene occurs as interstitial masses. Feldspars range in composition from oligoclase to andesine, and occur as relatively unaltered laths, or as slightly altered groundmass. The pyroxenes, pyroxene pseudomorphs, and feldspars are found as radiating skeletal crystals with chlorite cores. Large masses of chlorite and interstitial chlorite, where observed, can be attributed to be the alteration products of glass. Euhedral magnetite and leucoxene crystals have skeletal textures with sericite or talc-filled fractures. Stilpnomelane forms thin, euhedral, radiating crystal clusters or irregular masses. The medium-grained, high iron flows have estimated colour indexes of around 70 and the finer grained crumbly flows have estimated colour indexes of around 50.

Mafic metavolcanic flows in contact with the Round Lake Batholith have been metamorphosed to amphibolite facies rank. The effect of the metamorphism can be seen in outcrop for approximately 1 km from the contact. These rocks, composed of chlorite and amphibole, have a dark green fresh surface and a dark grey to brown weathered surface. They are similar to the less well-metamorphosed flows in appearance, except that some recrystallization is evident in hand sample. Primary textures and structures have been preserved, except for the flows immediately adjacent to the batholith. The contact is a complex, 6 m wide zone where there is an increasing amount of tonalite dike material until the rock is predominantly a tonalite with mafic metavolcanic xenoliths. The xenoliths and the mafic metavolcanics next to the contact have become gneissose with the formation of faint feldspar and amphibole bands.

Southeast of Thin Lake and east of Hope Lake in Tudhope Township, the mafic flows have become metamorphosed and contorted by the forceful intrusion of the late phase, granodioritic Hope Lake Stock of the Round Lake Batholith. The highly foliated, amphibolitized flows are crosscut by many granodioritic and aplite dikes of varying dimensions and orientations. Contorted remnant pillows may be seen in outcrops not immediately adjacent to the contact. Close to the contact, the flows become gneissose and highly recrystallized.

In northeastern Dack Township, the mafic metavolcanics are fine grained to very fine grained and highly schistose; schistosity has variable strikes and dips. There are no dikes of Round Lake Batholith material intruding these metavolcanics.

In thin section, it was noted that the mineralogy of the rocks becomes less complex as the contact with the batholith was approached. At about 1 km from the contact, the rocks are composed of chlorite, epidote, hornblende, quartz, and carbonate. The feldspars have been completely saussuritized. The feathery textured, subhedral hornblendes are altered to platy chlorites. Myrmekitic quartz occurs in anhedral grains and stringers. Along the contact, recrystallization is complete and the rocks are composed of clean, subhedral to euhedral hornblende, clean unaltered anhedral interstitial plagioclase and minor amounts of epidote, sericite, and quartz.

Carbonatized flows are found in Dack Township along the fault that parallels a part of the Englehart River. The rocks along this fault are schistose and the carbonate predominates along schistosity planes.

Intermediate to Felsic Metavolcanics

Intermediate to felsic metavolcanics are found conformably overlying and interbedded with the mafic flows in Tudhope, Bryce, Beauchamp, and Dack Townships. These intermediate to felsic metavolcanics are, for the most part, restricted to the Skead Group. The predominant rock type is pyroclastic. The rocks are tuff, lapilli-tuff, lapillistone, tuff-breccia, and pyroclastic breccia. The classification for the pyroclastic rocks used in this report is after Fisher (1966, p.292).

An irregularly-shaped sill of massive quartz-feldspar porphyry intrudes the pyroclastic rocks in Bryce and Tudhope Townships. Minor mafic flows are found within the pyroclastic rocks in Tudhope, Dack, and Beauchamp Townships. The weathered surface of all the intermediate to felsic metavolcanics varies from white to buff to greyish-white, while the fresh surface varies from grey-green to green to light green.

Intermediate to mafic flows are uncommon in the map area and were seen directly overlying the mafic metavolcanics in eastern Tudhope Township. These rocks are fine grained and massive with a lighter green fresh surface than the mafic flows.

Massive, fine-grained, quartz-feldspar porphyry occurs as elongate, irregularly-shaped sills within the pyroclastic rocks in Tudhope and Bryce Townships. Stratigraphically, these porphyry bodies occur below the pyroclastic breccia centred around Heather Lake. The euhedral, inequigranular, feldspar phyric phase comprises approximately 40 percent of the rock and the anhedral quartz phenocrysts comprise 10 to 15 percent. Both phenocryst types are set in a dense, aphanitic groundmass. The contacts of the porphyry sill with the surrounding pyroclastic rocks are intrusive and generally sharp. Metamorphosed fragments of the pyroclastic host rock are found as blocks incorporated within the porphyry. The boundaries of these xenoliths are generally indistinct.

The oligoclase feldspar phenocrysts of the porphyry exhibit poorly developed twinning and occur as euhedral and broken crystals which are altered to either sericite or saussurite. Rounded quartz phenocrysts have irregular, corroded grain boundaries. The very fine grained quartzofeldspathic groundmass contains chlorite and carbonate patches along with minor epidote. Carbonatization is also affecting the feldspar phenocrysts.

In Bryce and Tudhope Townships, the pyroclastic rocks form irregularly-shaped bodies interdigitating with each other. The greatest abundance of coarse-grained pyroclastic rocks is in the vicinity of Heather Lake in Bryce Township. Here, a 700 m thick ameoboid-shaped deposit of pyroclastic breccia 2500 m long grades laterally and vertically into predominantly tuff-breccia. Southwest and northeast of Honeymoon Lake, the coarse-grained pyroclastic rocks occur in smaller, lensoid shaped deposits interbedded with the finer pyroclastic rocks.

In Beauchamp and Dack Townships, the pyroclastic deposits are generally well bedded, better sorted, and may be traced farther along strike than those found in Bryce and Tudhope Townships. The coarser grained pyroclastic rocks are also not as abundant in Beauchamp and Dack Townships as they are in Bryce and Tudhope Townships.

All the pyroclastic rocks are genetically related, as many outcrops contain multiple pyroclastic rock types that grade into each other. The coarser, unsorted pyroclastic rocks grade imperceptibly into the finer pyroclastic rocks. Sharp contacts have been observed and finer grained beds are also seen to pinch out along strike.

Pyroclastic breccia, composed primarily of blocks greater than 64 mm set in an ash and lapilli matrix, is found throughout the Skead Group within the map area, but the rock predominates in Bryce and Tudhope Townships. The pyroclastic breccia is composed of round to subangular fragments of quartz-feldspar porphyry,

mafic volcanic material, tuff, and lapillistone. The mafic fragments tend to be more rounded than the more intermediate clasts. The matrix, composed of lithic and crystal ash and lapilli, is generally more mafic in composition than the clasts. It is difficult to distinguish essential fragments from accessory fragments in the pyroclastic breccia. The accessory clasts consist of the tuff and lapillistone fragments which are products from previous eruptions. Essential clasts may be the quartz-feldspar porphyry material which is similar to the sill found northwest of Heather Lake. Ribbed, bomb-shaped mafic fragments were occasionally seen as clasts and are assumed to represent essential material.

The pyroclastic breccia is poor to moderately sorted with both clast- and matrix-supported deposits. Clast sizes range from 64 mm to 2 m, with the average size being in the 10 to 40 cm range. Many clasts exhibit a 5 mm wide bleached reaction rim. This is especially conspicuous in the vicinity of Heather Lake.

Tuff-breccia, composed of a massive, thick bedded, chaotic assemblage of blocks, lapilli, and ash is found laterally interdigitated, with and immediately overlying the pyroclastic breccia. The greatest proportion of tuff-breccia is found in Bryce Township southeast of Heather Lake. In Dack and Beauchamp Township, tuff-breccia is found as well-developed beds with overlying tuff, lapilli-tuff, or lapillistone in both gradational and sharp contact.

The tuff-breccias are poorly sorted, and are matrix-supported with subangular to subround clasts composed of feldspar porphyry, tuff, hornblende porphyry, pumice, vesiculated mafic flow material, and ribbed mafic bombs. The lithic material is found in all size ranges from ash to block with some bomb sizes, some of which have pale reaction rims. The blocks and bombs are generally smaller in average size and are more round than those found in the pyroclastic breccia, and have an average size of 10 to 15 cm with a maximum size of 80 cm. The matrix is composed of euhedral and broken feldspar crystals along with ash and fine lapilli of the aforementioned lithic types.

Lapillistone, composed of a better sorted assemblage of lithic lapilli fragments with a minor ash and block component, is not common in the map area. It is found interbedded, or in gradational contact with the coarser pyroclastic rock types in Tudhope, Bryce, Beauchamp, and Dack Townships.

Lithic clasts found in the lapillistones are generally rounded to subrounded with an average size of 2 to 4 mm. Feldspar prophyry, pumice, and mafic volcanic material comprise the lithic fragments in a matrix of ash size crystals, lithics, and glass. Examination of a thin section of the matrix of a lapillistone revealed broken feldspar crystals, pyroxene crystals, ash size lithic fragments, and amygdaloidal and globular glass fragments which are altered to chlorite. Alteration has had a profound effect on the matrix material in some localities as the feldspars may be highly altered to sericite, while the pyroxenes retain their fresh appearance.

Lapilli-tuff, composed of a chaotic assemblage of lapilli, ash, and minor blocks is found interbedded with tuffs, lapillistone, and tuff-breccia in Tudhope, Bryce, Beauchamp, and Dack Townships. The subrounded to subangular clasts are very heterolithic and range in size up to 5 cm. Lithic clasts, consisting of pyroxene basalt, scoriaceous basalt, vesicular and epidotized basalt, pumice, very fine grained intermediate volcanic rocks, spherulitic intermediate volcanic rocks, medium-grained intrusive rocks, feldspar porphyry and quartz-feldspar porphyry are set in a very fine grained quartzofeldspathic and/or mafic glass matrix. The mafic glass has been altered to chlorite and the amygdules have been filled with quartz and carbonate. The quartzofeldspathic groundmass is commonly highly altered to sericite and epidote.

Tuff is found as thick, massive beds; as thin beds; and occasionally as fine laminations interbedded with the coarser pyroclastic rocks. The tuffs are generally well to moderately sorted and are composed of crystals, lithic fragments, or a combination of both. The angular to subangular feldspar crystal clasts and lithic clasts vary in size from less than 0.5 to 2 mm. Lithic tuffs are generally heterolithic, containing spherulitic intermediate to felsic volcanic rocks, feldspar porphyry, pumice, quartzofeldspathic material, and pyroxene crystals with a minor quartzo-

feldspathic matrix. Crystal tuffs are composed of twinned and untwinned feldspars set in a quartzofeldspathic matrix. Saussuritization, sericitization, and carbonatization are common alteration effects in the tuffs.

In the vicinity of Heather Lake, the pyroclastic rocks are strongly sheared and carbonatized. Carbonate is found in veinlets and as replacement patches in the finer grained matrix of the pyroclastic rocks and in the feldspars. In southern Tudhope and Bryce Townships, the intermediate to felsic metavolcanics overlying the Nipissing Diabase sill have been strongly deformed and metamorphosed to amphibolite facies rank.

The irregularly-shaped quartz-feldspar porphyry sill found intruding the pyroclastic rocks northwest of Heather Lake may have been, in part, a high level magma chamber. Some of the outcrops containing more than one pyroclastic rock type grading into each other resemble subaqueous pyroclastic flows as described by Fiske (1963) and Fiske and Matsuda (1964). Fiske (1963) recognized the most common type of subaqueous pyroclastic flow as containing a great variety of lithic fragments chaotically mixed with pumice lapilli, whole and broken crystals, and 20 to 70 percent glassy matrix. A less common variety contained abundant pumice and delicate glass shards with up to 70 percent fine ash matrix. Both these types may correspond to some of the tuff-breccia to lapilli-tuff deposits found in the Hill Lake area.

Subaqueous pyroclastic flows are usually composed of a massive, coarse-grained, poorly sorted lower part grading upward into a finer grained, sometimes bedded upper part. Fiske and Matsuda (1964) noted that basal contacts may be sharp on undisturbed beds. The rocks are commonly poorly sorted, particularly in their massive lower parts. In many places in the Hill Lake area, outcrops are observed containing coarse-grained pyroclastic breccia or tuff-breccia grading up into finer grained, lapilli-tuff or bedded tuff which is then overlain with a sharp contact by a coarser grained pyroclastic rock.

Ultramafic Metavolcanics

Ultramafic metavolcanic flows and intrusions are found in the Wabewawa Group of metavolcanics in Dack Township where they are interbedded with mafic volcanic flows. A 170 m thick unit defines the top of the Wabewawa Group and can be traced from Sunday Creek Falls on the Englehart River northeast to Trestle Hill west of Englehart. North of the town of Charlton, several altered ultramafic horizons are found interbedded with mafic metavolcanics.

The ultramafic metavolcanics defining the top of the Wabewawa Group consist of several flows which have been intruded by small peridotite bodies and then were disrupted by northeast-trending shear zones. Massive fine- to coarse-grained peridotite predominates with minor pyroxene spinifex zones. The rocks are pale green to dark green on weathered surfaces and greenish grey to black on fresh surfaces. They are slightly to strongly magnetic and are quite soft, being altered to tremolite. Euhedral bladed pyroxene crystals average 2 cm in length and are subparallel to subradiating. Pyroxene crystals up to 50 cm in length were seen at the top of the ultramafic horizon perpendicular to the contact. Strong alteration to serpentine and tremolite was observed in northeast-trending shear zones. Because of this alteration, the sheared rocks weather recessively.

Massive, unaltered peridotite contains an estimated 70 percent augite with slightly corroded crystal boundaries and shows some evidence of grinding. The augites are imbedded in a matrix of chlorite, tremolite, epidote, and magnetite. Fractures in the augite crystals contain tremolite as an alteration product. Pyroxene spinifex-textured peridotites are highly altered; the pyroxene is almost totally altered to tremolite/actinolite and carbonate. Thin section examination reveals that these pseudomorphic crystals form rosettes. The finer grained groundmass has been altered to a mass of chlorite, anthophyllite, epidote, and tremolite/actinolite.

The black, smooth weathered intrusive plug of peridotite that occurs within the ultramafic flows is fine grained, and massive having a "brecciated" appearance due to the network like alteration to serpentine (Photo 1). The massive parts of this

Photo 1. *Massive peridotite (intrusive into ultramafic flows) at Trestle Hill in Dack Township.*

small intrusion are highly altered with the olivines totally altered to antigorite, magnetite, and chlorite, while the pyroxenes are totally altered to tremolite/actinolite. Grains of magnetite rim the olivine pseudomorphs which contain chlorite cores.

Talc-carbonate schists, which are strongly sheared ultramafic flows, occur along the Englehart River north of Charlton. These rocks are dark grey to silvery coloured on both the weathered and fresh surfaces. The carbonate alteration predominates along the planes of schistosity. In one location, possible highly deformed polysuturing was encountered. Chlorite schists are dark green and are commonly carbonatized. The schistosity, in places, is highly contorted. Both the talc-carbonate schists and chlorite schists weather recessively and have only been found exposed along the Englehart River.

In spite of the strong shearing, olivine pseudomorphs and the primary rock textures can be recognized in thin section. Olivine pseudomorphs of talc and carbonate were seen rimmed with magnetite. Minor radiating antigorite also occurs within the olivine pseudomorphs. Carbonate is very prominent as a replacement mineral in the olivines and along the planes of schistosity.

Geochemistry of the Metavolcanics

Thirty samples were collected by the field party. These are representative of the three volcanic groups, and were submitted for major and minor element analyses

by the Geoscience Laboratories, Ontario Geological Survey. A further ten samples were collected by David Good and were analyzed by him (Good 1981). The results of these analyses and their locations are compiled in Table 2. Each sample submitted by the field party for the analyses consisted of approximately 1 kg of rock chips; the weathered and altered surfaces were removed.

The samples collected from the Wabewawa Group consist of talc-carbonate schists; the basal crystalline part of a spinifextextured basalt flow and the crystalline phases of fine-grained and medium-grained basalts. Samples collected by the field party from the Catharine Group consist entirely of crystalline mafic flows. The Skead Group contains pyroclastic rock flows and intrusive rocks. The finer grained pyroclastic rocks were sampled in an attempt to obtain an even mixture of clasts and matrix. An individual clast of the very coarse grained pyroclastic breccia found in Bryce Township was sampled and may represent a primary magma. Two samples were collected from the Britcanna Porphyry and one each of the quartz-feldspar subvolcanic sill in Bryce Township and the porphyritic diorite in Beauchamp Township. The frothy mafic flow and gabbro sill in Beauchamp and Dack Townships were also sampled.

In order to classify the volcanic rocks, the results of the analyses were plotted on diagrams derived by Irvine and Baragar (1971) and Jensen (1976). Both methods of classification are in agreement as to the chemical affinity of each sample, but not always to the rock name. Figures 2, 3, and 4 are AFM ternary plots of the Wabewawa Group, Catharine Group and Skead Group. Figures 5, 6, and 7 are Normative Plagioclase/Colour Index binary plots of the Wabewawa Group, Catharine Group, and Skead Group. Figures 8, 9, and 10 are Al-Fe-Mg cation plots for the Wabewawa Group, Catharine Group and Skead Group. The AFM ternary plot and the Al-Fe-Mg cation plot are the best plots for discriminating between the volcanic groups.

The best chemical discrimination is displayed in Figures 8, 9, and 10. The Wabewawa Group consists of komatiitic ultramafic and mafic flows interbedded with mafic flows that group around the calc-alkalic and tholeiitic high Mg-high Fe boundary area. Sample 1 of Figure 8 is a plot of the coarse-grained, magnetite-rich part of a spinifex-textured mafic flow. If the finer grained part had been sampled, the true composition may have been in the komatiitic basalt field. The AFM diagram, Figure 2, shows more of a spread in the mafic part of the diagram with a definite split between calc-alkalic and tholeiitic compositions, but the calc-alkalic rocks plot close to the curve. The Catharine Group volcanic rocks consist predominantly of high iron tholeiitic basalts as shown by Figure 9. The AFM diagram, Figure 3, groups all the samples in the tholeiitic field, and when compared with Figure 2, shows an iron enrichment trend from the Wabewawa Group to the Catharine Group. The two anomalous samples analyzed by Good (1981) may be due to alteration by the Round Lake Batholith. Both the AFM diagram and the Al-Fe-Mg cation plot of analyses from the Skead Group (Figures 4 and 10) exhibit a calc-alkalic trend in the volcanic rocks. Figure 7, the Normative Plagioclase/Colour Index diagram also shows a linear trend, except more of the samples plot in the tholeiitic basalt field than in Figures 5 and 6. Figure 10 exhibits the difference in composition between those metavolcanics found in Bryce and Tudhope Townships and those found in Dack and Beauchamp Townships. In Bryce and Tudhope Townships, the pyroclastic rocks and associated intrusions are intermediate to felsic in composition, while those in Dack and Beauchamp Townships are intermediate to mafic. This grouping can be seen on Figure 4, the AFM diagram, but is not readily apparent.

Figures 11 and 12 are CaO versus MgO and Al_2O_3 versus MgO plots of the mafic lavas found in the Wabewawa Group and Catharine Group. As shown by Jackson (1980), these two figures show the effect on the residual component by removing clinopyroxene from the melt and also may explain the evolution towards a high iron differentiate as seen in the Catharine Group. Clinopyroxene, composed chiefly of calcium, magnesium, and silicon with some aluminium, will decrease the amounts of calcium, magnesium, and aluminium in the melt as it crystallizes.

TABLE 2. NORMATIVE AND CHEMICAL ANALYSES OF THE METAVOLCANIC ROCKS AND RELATED INTRUSIONS IN THE HILL LAKE AREA.

Sample No.	80-GWJ-0290	80-GWJ-0351	80-GWJ-0353	80-GWJ-0356
Latitude	47°45'39"	47°49'55"	47°49'52"	47°30'11"
Longitude	79°55'42"	79°55'52"	79°59'52"	80°00'00"
Group	WABEWAWA	WABEWAWA	WABEWAWA	WABEWAWA
SiO_2	43.80	49.30	47.40	33.40
Al_2O_3	9.20	15.30	10.00	2.18
Fe_2O_3	8.00	3.07	3.00	7.03
FeO	13.10	7.77	12.10	5.10
MgO	6.18	6.68	8.44	19.00
CaO	10.60	11.60	11.30	13.60
Na_2O	2.39	2.10	2.21	0.00
K_2O	0.15	0.03	0.22	0.00
TiO_2	1.07	1.29	1.67	0.44
P_2O_5	0.07	0.06	0.08	0.01
MnO	0.15	0.16	0.22	0.18
CO_2	1.71	0.20	0.77	15.20
S	0.04	0.14	0.09	0.13
H_2O+	3.07	1.11	1.69	1.55
H_2O-	0.69	0.71	0.48	0.51
LOI[1]	5.20	2.00	1.70	17.80
Total	99.90	99.50	99.70	98.30
Trace Elements				
Ba	150	60	90	50
Co	82	42	64	133
Cr	7	279	405	1750
Li	6	8	13	9
Mo	-5	-5	-5	-5
Ni	142	122	177	1780
Pb	-10	74	475	-10
Sr	480	110	185	155
V	580	385	390	75
Y	18	24	18	4
Zn	185	98	150	50
Zr	60	25	60	-1
Cu	585	84	196	102
CIPW NORMS				
PYRT	0.2	0.3	0.2	0.3
ILMN	4.5	2.5	3.3	1.0
ORTH	2.0	0.2	1.3	0.0
ALBT	21.0	18.2	19.3	0.0
ANRT	14.0	33.1	17.3	7.4
MGNT	5.7	4.2	4.5	3.5
DIOP	14.4	13.7	19.5	23.3
HEDN	20.0	7.4	13.9	6.6
ENST	0.0	10.7	7.5	0.0
FERS	0.0	6.6	6.2	0.0
QRTZ	0.0	3.0	0.0	0.0
FORS	6.6	0.0	3.6	33.6
FAYA	11.5	0.0	3.3	12.1
CASI	0.0	0.0	0.0	12.1
CDNM	0.0	0.0	0.0	0.0
FEMG	0.4	0.3	0.4	0.7
RMG	0.5	0.7	0.6	0.8
RFE	0.5	0.3	0.4	0.2

[1]Loss on ignition
A negative number indicates a value below the detection limit where that number is the detection level.

TABLE 2 CONTD.

Sample No.	80-GWJ-0358	80-GWJ-0360	80-GWJ-0361	80-GWJ-0362
Latitude	47°30'09"	47°30'13"	47°30'16"	47°30'18"
Longitude	80°00'04"	80°00'09"	80°00'03"	79°59'58"
Group	WABEWAWA	WABEWAWA	WABEWAWA	WABEWAWA
SiO_2	49.60	53.60	45.20	52.20
Al_2O_3	15.60	15.60	7.65	15.20
Fe_2O_3	2.79	4.38	1.30	2.59
FeO	6.07	6.32	9.29	7.12
MgO	7.91	5.32	24.90	6.83
CaO	9.77	6.23	1.53	7.36
Na_2O	2.54	4.60	0.00	4.04
K_2O	0.69	0.38	0.00	0.26
TiO_2	0.76	1.02	0.69	1.04
P_2O_5	0.02	0.06	0.00	0.04
MnO	0.18	0.15	0.11	0.19
CO_2	0.18	0.20	2.22	0.27
S	0.02	0.01	0.05	0.01
H_2O+	1.68	1.49	5.19	1.42
H_2O-	0.50	0.47	0.51	0.40
LOI[1]	2.20	1.70	8.90	2.00
Total	98.30	99.80	98.60	99.00
Trace Elements				
Ba	120	240	30	90
Co	39	35	98	36
Cr	420	22	3020	122
Li	20	12	14	16
Mo	-5	-5	-5	-5
Ni	76	27	1360	40
Pb	-10	-10	-10	66
Sr	155	150	25	80
V	225	270	140	270
Y	12	18	-1	16
Zn	80	63	100	145
Zr	7	45	7	40
Cu	65	6	46	38
CIPW NORMS				
PYRT	0.0	0.0	0.1	0.0
ILMN	1.5	2.0	1.4	2.0
ORTH	4.3	2.3	0.0	1.6
ALBT	22.4	39.9	0.0	35.3
ANRT	30.4	21.3	8.4	23.3
MGNT	3.4	3.7	2.1	3.8
DIOP	11.6	4.9	0.0	7.8
HEDN	4.7	3.6	0.0	3.9
ENST	13.7	11.3	62.1	13.9
FERS	6.4	9.6	15.0	7.9
ORTZ	0.0	1.2	0.0	0.4
FORS	1.0	0.0	4.4	0.0
FAYA	0.5	0.0	1.2	0.0
CASI	0.0	0.0	0.0	0.0
CDNM	0.0	0.0	5.4	0.0
FEMG	0.3	0.2	0.8	0.3
RMG	0.7	0.6	0.8	0.7
RFE	0.3	0.4	0.2	0.3

[1]Loss on ignition
A negative number indicates a value below the detection limit where that number is the detection level.

TABLE 2 CONTD.

Sample No.	80-GWJ-0364	80-GWJ-0365	80-GWJ-0366
Latitude	47°30'18"	47°30'24"	47°30'24"
Longitude	79°59'50"	79°59'50"	79°59'50"
Group	WABEWAWA	WABEWAWA	WABEWAWA
SiO_2	51.00	39.80	52.20
Al_2O_3	17.00	4.74	15.40
Fe_2O_3	2.41	5.78	3.50
FeO	5.99	5.78	9.12
MgO	7.57	26.20	5.33
CaO	9.72	4.58	8.45
Na_2O	2.65	0.00	2.40
K_2O	0.53	0.00	0.08
TiO_2	0.74	0.37	0.98
P_2O_5	0.03	0.00	0.02
MnO	0.16	0.12	0.18
CO_2	0.31	6.99	0.27
S	0.01	0.01	0.01
H_2O+	1.83	5.39	1.53
H_2O-	0.44	0.45	0.67
LOI[1]	2.31	11.90	1.81
Total	100.40	100.20	100.10
Trace Elements			
Ba	100	20	50
Co	35	91	42
Cr	120	1290	12
Li	19	5	12
Mo	-5	-5	-5
Ni	46	1140	23
Pb	125	-10	116
Sr	105	54	45
V	215	85	375
Y	11	1	18
Zn	89	26	130
Zr	9	2	10
Cu	36	26	15
CIPW NORMS			
PYRT	0.0	0.0	0.0
ILMN	1.4	0.8	1.9
ORTH	3.2	0.0	0.5
ALBT	22.9	0.0	20.8
ANRT	33.7	14.9	31.8
MGNT	3.3	3.1	3.7
DIOP	9.1	7.4	4.7
HEDN	3.6	1.5	4.6
ENST	15.1	26.3	11.4
FERS	6.8	6.1	13.0
QRTZ	0.9	0.0	7.5
FORS	0.0	31.7	0.0
FAYA	0.0	8.1	0.0
CASI	0.0	0.0	0.0
CDNM	0.0	0.0	0.0
FEMG	0.3	0.9	0.3
RMG	0.7	0.8	0.5
RFE	0.3	0.2	0.5

[1]Loss on ignition
A negative number indicates a value below the detection limit where that number is the detection level.

TABLE 2 CONTD.

Sample No.	80-GWJ-314A	80-GWJ-0347	80-GWJ-0352	80-GWJ-0379
Latitude	47°48'02"	47°47'55"	47°49'20"	47°48'17"
Longitude	79°53'49"	79°54'07"	79°55'16"	79°55'48"
Group	CATHARINE	CATHARINE	CATHARINE	CATHARINE
SiO_2	48.90	48.50	48.10	48.30
Al_2O_3	15.40	15.90	13.70	14.50
Fe_2O_3	3.20	5.20	4.80	3.00
FeO	11.10	9.88	10.60	12.90
MgO	3.32	3.17	4.82	5.84
CaO	5.66	5.94	9.27	5.61
Na_2O	4.34	4.34	2.35	3.62
K_2O	0.02	0.04	0.23	0.13
TiO_2	1.82	1.67	1.84	1.67
P_2O_5	0.08	0.09	0.10	0.07
MnO	0.39	0.40	0.24	0.25
CO_2	1.10	1.17	0.09	0.32
S	0.11	0.10	0.07	0.04
H_2O+	2.94	2.80	2.13	3.36
H_2O-	0.65	0.71	0.64	0.42
LOI[1]	3.40	3.60	2.20	2.70
Total	99.00	99.90	99.00	100.00
Trace Elements				
Ba	80	90	80	60
Co	50	48	51	57
Cr	66	64	48	40
Li	17	17	14	18
Mo	-5	-5	-5	-5
Ni	43	41	44	67
Pb	31	27	10	210
Sr	85	85	215	11
V	435	410	435	435
Y	25	23	24	18
Zn	170	170	150	160
Zr	70	65	45	35
Cu	114	124	132	148

[1]Loss on ignition
A negative number indicates a value below the detection limit where that number is the detection level.

CIPW NORMS				
PYRT	0.2	0.2	0.1	0.1
ILMN	3.7	3.3	3.6	3.3
ORTH	0.1	0.2	1.4	0.8
ALBT	38.9	38.6	20.4	31.9
ANRT	23.8	25.0	27.3	23.9
MGNT	4.9	4.8	5.0	4.5
DIOP	1.9	1.8	7.9	2.0
HEDN	3.1	3.3	9.4	2.3
ENST	7.9	6.5	8.8	11.6
FERS	14.5	13.8	12.1	15.0
QRTZ	0.8	0.0	3.5	0.0
FORS	0.0	0.7	0.0	1.8
FAYA	0.0	1.6	0.0	2.6
CASI	0.0	0.0	0.0	0.0
CDNM	0.0	0.0	0.0	0.0
FEMG	0.2	0.2	0.3	0.3
RMG	0.4	0.4	0.5	0.5
RFE	0.6	0.6	0.5	0.5

TABLE 2 CONTD.

Sample No.	80-GWJ-1326	80-GWJ-2444	80-GWJ-2455
Latitude	47°46'51"	47°43'43"	47°45'03"
Longitude	79°53'56"	80°06'44"	80°04'20"
Group	CATHARINE	CATHARINE	CATHARINE
SiO_2	46.50	48.30	48.20
Al_2O_3	16.20	12.80	13.00
Fe_2O_3	4.49	4.20	4.80
FeO	8.74	9.47	12.20
MgO	6.32	2.60	4.61
CaO	9.91	8.46	9.64
Na_2O	1.83	1.30	1.99
K_2O	0.37	0.01	0.07
TiO_2	1.15	1.64	1.87
P_2O_5	0.07	0.09	0.09
MnO	0.21	0.20	0.26
CO_2	0.56	5.81	0.10
S	0.09	0.09	0.12
H_2O+	3.25	3.03	2.41
H_2O-	0.52	0.61	0.41
LOI[1]	3.31	8.50	2.00
Total	100.20	98.60	99.70
Trace Elements			
Ba	140	50	70
Co	49	41	55
Cr	287	58	15
Li	18	14	18
Mo	-5	-5	-5
Ni	132	40	29
Pb	-10	-10	-10
Sr	240	60	100
V	370	410	480
Y	24	30	30
Zn	125	102	170
Zr	65	30	55
Cu	105	62	106
CIPW NORMS			
PYRT	0.2	0.2	0.1
ILMN	2.3	3.5	2.3
ORTH	2.3	0.1	4.5
ALBT	16.2	12.4	19.6
ANRT	36.5	32.6	36.2
MGNT	4.0	5.1	4.0
DIOP	6.7	4.3	6.2
HEDN	5.6	8.0	4.0
ENST	13.2	5.3	5.5
FERS	12.8	11.5	4.1
ORTZ	0.0	17.0	0.0
FORS	0.1	0.0	7.4
FAYA	0.1	0.0	6.1
CASI	0.0	0.0	0.0
CDNM	0.0	0.0	0.0
FEMG	0.3	0.2	0.3
RMG	0.6	0.4	0.6
RFE	0.4	0.6	0.4

[1]Loss on ignition

A negative number indicates a value below the detection limit where that number is the detection level.

TABLE 2 CONTD.

Sample No.	80-GWJ-0263	80-GWJ-1319	80-GWJ-1321	80-GWJ-1322
Latitude	47°44'51"	47°41'57"	47°44'36"	47°44'47"
Longitude	79°57'32"	80°07'43"	79°59'40"	79°57'48"
Group	SKEAD	SKEAD	SKEAD	SKEAD
SiO_2	50.80	64.30	51.30	60.40
Al_2O_3	15.40	15.50	16.20	16.10
Fe_2O_3	3.06	0.39	3.38	2.02
FeO	5.83	2.51	7.04	4.77
MgO	5.49	2.21	7.00	2.89
CaO	9.56	5.10	7.70	5.27
Na_2O	2.84	3.27	2.02	3.40
K_2O	0.15	1.47	0.66	0.56
TiO_2	1.07	0.47	0.86	0.83
P_2O_5	0.07	0.00	0.12	0.11
MnO	0.15	0.07	0.17	0.11
CO_2	1.71	3.33	0.37	0.10
S	0.04	0.01	0.02	0.06
H_2O+	3.07	1.83	3.43	2.86
H_2O-	0.69	0.43	0.45	0.53
LOI[1]	5.20	5.20	3.61	3.01
Total	99.90	100.80	100.70	100.00
Trace Elements				
Ba	160	220	200	110
Co	32	13	37	21
Cr	168	50	273	45
Li	14	10	26	18
Mo	-5	-5	-5	-5
Ni	57	36	162	34
Pb	225	-10	-10	-10
Sr	175	225	315	155
V	195	80	170	100
Y	16	6	13	15
Zn	390	38	102	120
Zr	60	70	50	115
Cu	70	32	235	110
CIPW NORMS				
PYRT	0.1	0.0	0.0	0.1
ILMN	2.3	0.9	1.7	1.6
ORTH	0.9	9.1	4.0	3.4
ALBT	25.2	29.0	17.7	29.8
ANRT	29.9	24.4	34.4	27.1
MGNT	4.0	0.6	3.6	3.0
DIOP	10.9	1.1	2.7	0.0
HEDN	5.2	0.6	1.6	0.0
ENST	9.4	5.3	16.8	7.5
FERS	5.1	3.5	11.2	6.0
QRTZ	6.9	25.4	6.1	21.0
FORS	0.0	0.0	0.0	0.0
FAYA	0.0	0.0	0.0	0.0
CASI	0.0	0.0	0.0	0.0
CDNM	0.0	0.0	0.0	0.3
FEMG	0.2	0.1	0.3	0.1
RMG	0.7	0.7	0.7	0.6
RFE	0.3	0.3	0.3	0.4

[1]Loss on ignition
A negative number indicates a value below the detection limit where that number is the detection level.

TABLE 2 CONTD.

Sample No.	80-GWJ-1323	80-GWJ-1324	80-GWJ-1325	80-GWJ-2442
Latitude	47°44'55"	47°44'19"	47°46'11"	47°42'55"
Longitude	79°57'53"	79°56'07"	79°54'56"	80°08'25"
Group	SKEAD	SKEAD	SKEAD	SKEAD
SiO_2	57.20	54.70	60.70	68.90
Al_2O_3	16.80	15.90	16.30	17.20
Fe_2O_3	2.04	2.31	1.87	0.51
FeO	4.37	5.50	4.13	1.78
MgO	3.87	6.67	3.71	1.35
CaO	7.48	6.21	4.45	1.33
Na_2O	2.83	3.28	3.34	3.53
K_2O	0.23	0.50	1.46	2.68
TiO_2	0.61	0.79	0.65	0.54
P_2O_5	0.07	0.04	0.08	0.11
MnO	0.11	0.12	0.09	0.03
CO_2	0.16	0.08	0.14	0.62
S	0.01	0.00	0.01	0.01
H_2O+	3.26	3.75	2.45	1.36
H_2O-	0.53	0.60	0.51	0.42
LOI[1]	3.60	3.91	2.80	2.21
Total	99.60	100.40	99.90	100.40
Trace Elements				
Ba	100	110	460	800
Co	25	34	21	7
Cr	65	222	66	7
Li	18	18	14	4
Mo	-5	-5	-5	-5
Ni	61	133	50	6
Pb	-10	-10	-10	-10
Sr	60	80	305	275
V	100	145	105	45
Y	8	13	10	6
Zn	83	90	81	59
Zr	75	95	85	140
Cu	39	30	30	-5
CIPW NORMS				
PYRT	0.0	0.0	0.0	0.0
ILMN	1.2	1.6	1.3	1.0
ORTH	1.4	3.1	8.9	16.2
ALBT	25.0	28.9	29.2	30.5
ANRT	33.9	28.3	22.8	6.7
MGNT	3.1	3.5	2.8	0.8
DIOP	2.6	2.2	0.0	0.0
HEDN	1.3	0.8	0.0	0.0
ENST	8.9	16.3	9.5	3.4
FERS	5.1	7.0	5.3	2.1
QRTZ	17.3	8.3	18.9	33.0
FORS	0.0	0.0	0.0	0.0
FAYA	0.0	0.0	0.0	0.0
CASI	0.0	0.0	0.0	0.0
CDNM	0.0	0.0	1.2	6.2
FEMG	0.1	0.2	0.1	0.0
RMG	0.7	0.2	0.1	0.0
RFE	0.3	0.2	0.3	0.3

[1]Loss on ignition
A negative number indicates a value below the detection limit where that number is the detection level.

TABLE 2 CONTD.

Sample No.	80-GWJ-2443	80-GWJ-1327	80-GWJ-2445	80-GWJ-2446
Latitude	47°42'57"	47°45'54"	47°44'13"	47°43'43"
Longitude	80°07'46"	79°56'56"	80°06'08"	80°05'29"
Group	SKEAD	SKEAD	SKEAD	SKEAD
SiO_2	63.90	45.90	68.40	67.80
Al_2O_3	15.50	17.30	16.40	16.40
Fe_2O_3	0.24	3.40	1.84	1.49
FeO	2.91	8.82	1.86	2.26
MgO	2.12	7.31	1.29	1.60
CaO	4.23	9.48	4.32	3.22
Na_2O	3.44	2.24	3.93	3.96
K_2O	1.34	0.74	0.44	0.80
TiO_2	0.31	1.17	0.61	0.53
P_2O_5	0.06	0.05	0.08	0.09
MnO	0.07	0.25	0.07	0.07
CO_2	3.20	0.09	0.13	0.51
S	0.01	0.05	0.01	0.01
H_2O+	1.77	3.11	0.70	1.27
H_2O-	0.45	0.53	0.72	0.52
LOI[1]	5.00	3.11	1.41	2.00
Total	99.60	100.40	100.80	100.50
Trace Elements				
Ba	250	130	140	250
Co	12	45	8	8
Cr	80	241	9	9
Li	12	22	14	16
Mo	-5	-5	-5	-5
Ni	38	146	9	7
Pb	-10	11	-10	-10
Sr	180	160	280	265
V	55	280	60	40
Y	5	21	10	8
Zn	52	120	53	65
Zr	85	35	65	100
Cu	-5	102	18	16
CIPW NORMS				
PYRT	0.0	0.1	0.0	0.0
ILMN	0.6	2.3	1.2	1.0
ORTH	8.4	4.5	2.6	4.8
ALBT	30.9	19.6	33.5	34.1
ANRT	22.3	36.2	21.6	16.3
MGNT	0.4	4.0	2.7	2.2
DIOP	0.0	6.2	0.0	0.0
HEDN	0.0	4.0	0.0	0.0
ENST	5.6	5.5	3.2	4.1
FERS	5.1	4.1	1.0	2.2
QRTZ	25.9	0.0	32.5	32.1
FORS	0.0	7.4	0.0	0.0
FAYA	0.0	6.1	0.0	0.0
CASI	0.0	0.0	0.0	0.0
CDNM	0.7	0.0	1.6	3.2
FEMG	0.1	0.3	0.0	0.1
RMG	0.6	0.6	0.8	0.7
RFE	0.4	0.4	0.2	

[1]Loss on ignition

A negative number indicates a value below the detection limit where that number is the detection level.

TABLE 2 CONTD.

Sample No. Location	DG-26	DG-29	DG-35a	DG-18a Robillard Township	DG-19 Robillard Township
Group	CATHARINE	CATHARINE	CATHARINE	CATHARINE	CATHARINE
SiO_2	48.55	54.46	52.35	44.51	54.27
Al_2O_3	13.21	13.10	12.49	11.63	8.28
Fe_2O_3	14.00	7.41	16.20	18.32	15.01
FeO					
MgO	2.73	7.92	4.21	5.09	13.42
CaO	15.55	7.85	9.47	8.96	4.23
Na_2O	0.46	5.29	2.47	1.92	1.53
K_2O	0.04	0.21	0.11	0.18	0.11
TiO_2	1.25	0.60	1.64	1.73	1.04
P_2O_5	0.09	0.31	0.12	0.07	0.15
MnO	0.25	011	0.34	0.24	0.31
CO_2					
S					
H_2O+					
H_2O-					
LOI[1]	1.17	2.55	1.35	1.63	2.21
Total	97.30	99.81	100.75	94.28	100.56
Trace Elements					
Ba	20	53	28	27	16
Co	53	32	62	76	
Cr	188	414	201	39	
Li					
Mo					
Ni	45.7	198.9	31.5	439.1	
Pb	7	16	8	10	
Sr	86	969	218	116	99
V	277	106	338	191	
Y	41	34	54	47	35
Zn	128	76	168	121	
Zr	70	118	93	69	70
Cu	49	33	128	149	

[1]Loss on ignition

Plagioclase will only affect the calcium and aluminium content, but not the magnesium, whereas the removal of olivine will affect the magnesium, and not the aluminium and calcium. The trend shown in Figures 11 and 12 indicates that the source providing the magma for the Wabewawa and Catharine Groups may have been continuous throughout the deposition of both volcanic groups. Although there is overlap in the positions of both groups on the plots, the Catharine Group tends to occupy the low end of the plot.

Volcanic Stratigraphy

The metavolcanics within the map area were previously grouped into one classification called the Skead Group consisting of the Catharine Basalts and the Skead Pyroclastics (Ridler and Foster 1981). This group has been subdivided by Jensen (1978a, 1978b, 1979) into three groups. The former Catharine Basalts have been subdivided into the Wabewawa Group and the Catharine Group and the Skead Pyroclastics are currently called the Skead Group. These three groups form a homoclinal sequence 11 880 m thick. This is a minimum thickness, as the base of the sequence has been intruded by the Round Lake Batholith and the top is covered by the Cobalt Group sediments.

The Wabewawa Group is exposed only in Dack Township, but can be traced from the northeastern corner of Dack Township west-southwest to the Cross Lake

TABLE 2 CONTD.

Sample No.	DG-20	DG-37	DG-39	DG-44a	DG-45
Location	Robillard Township	Robillard Township	Robillard Township	Robillard Township	Robillard Township
Group	CATHARINE	CATHARINE	CATHARINE	CATHARINE	CATHARINE
SiO_2	46.75	49.38	46.39	51.84	47.52
Al_2O_3	13.47	11.98	13.90	13.61	11.73
Fe_2O_3	17.30	19.63	17.69	16.06	18.67
FeO					
MgO	5.92	4.04	3.45	4.31	3.99
CaO	8.93	7.32	10.80	8.54	8.28
Na_2O	2.80	2.69	2.75	3.52	2.53
K_2O	0.32	0.34	0.35	0.38	0.25
TiO_2	1.43	1.99	1.41	1.55	1.81
P_2O_5	0.08	0.22	0.11	0.11	0.14
MnO	0.25	0.27	0.41	0.33	0.27
CO_2					
S					
H_2O+					
H_2O-					
LOI[1]	1.64	0.74	0.46	2.36	0.68
Total	98.90	98.60	97.72	102.61	95.87
Trace Elements					
Ba	43	35	31	85	24
Co	65	78	60	59	70
Cr	58	52	57	73	41
Li					
Mo					
Ni	55.8	0.0	49.6	23.7	0.0
Pb	7	6	8	7	6
Sr	201	217	132	109	174
V	317	326	312	329	351
Y	36	57	46	46	57
Zn	118	119	130	123	92
Zr	66	136	76	83	102
Cu	136	43	89	57	122

[1]Loss on ignition

Fault, a distance of 13 600 m. Because the base of this Group is intruded by the Round Lake Batholith, it has a minimum thickness within the map area of 1800 to 3000 m. The metavolcanics within the Wabewawa Group consist predominantly of high magnesian basalts with minor high iron basalts and komatiitic basalt and ultramafic rocks. The ultramafic rocks consist of flows with massive and pyroxene spinifex-textured zones intruded by pods of serpentinized peridotite. A 100 m thick zone of dark grey to black magnetite rich basalt can be delineated near the top of the Group and the upper contact of this basalt contains a spectacular 1.6 m thick spinifex-textured zone. Immediately overlying this is a 1.13 m thick, thickly laminated, pyritiferous cherty tuff horizon. The top of the Wabewawa Group consists of a 160 m thick horizon of schistose, spinifex-textured, and massive ultramafic flows which has a definite aeromagnetic signature which can be traced to the Cross Lake Fault. The metavolcanics have been intruded by the Charlton layered intrusion which may be related to the ultramafic flows. Sills of gabbro and hornblende gabbro intrude the basalts in northeastern Dack Township and they may be related to the basaltic volcanism.

The Catharine Group of metavolcanics is found throughout the map area and can be traced from Dack to Tudhope Townships. The base of this Group appears to be conformable with the Wabewawa Group in Dack Township, but has been intruded by the Round Lake Batholith in Robillard, Bryce, and Tudhope Townships. In Dack Township, where both the base and the top of the Catharine Group can be

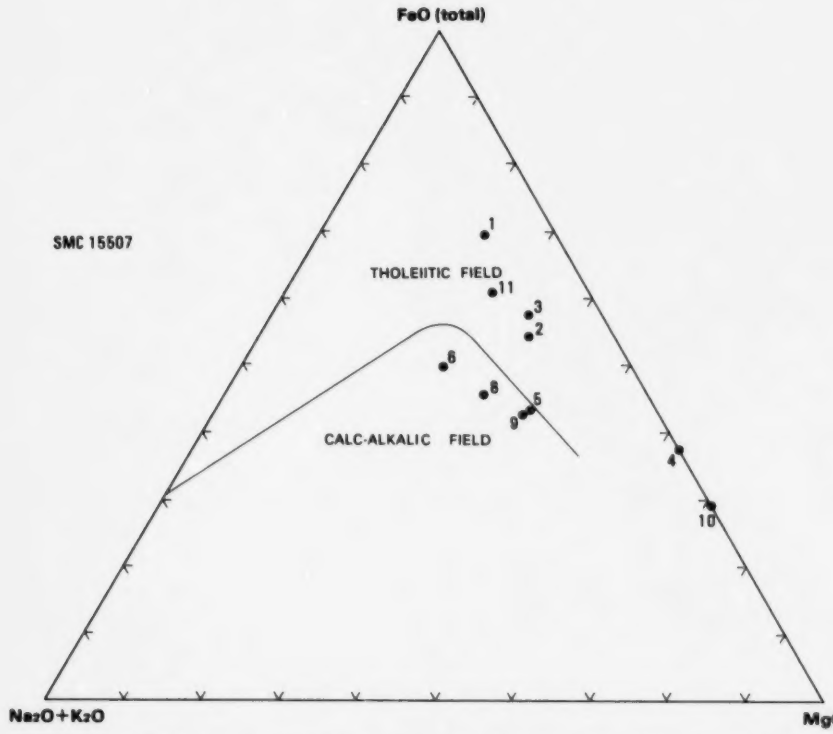

Figure 2. *AFM Ternary Plot (after Irvine and Baragar 1971) of the Wabewawa Group. (See Figures 8, 9, and 10 for sample numbers).*

delineated, it is 4400 m thick. The metavolcanics consist primarily of high iron basalt flows. There are two types of high iron flows: a fine-grained green basalt and a very fine grained black basalt which has been delineated on the map. Flow features, such as pillows, amygdules, isolated pillow breccia, and broken pillow breccia are common within this group of rocks. The top of the Catharine Group occurs with the thick high iron basalt sequence above the first introduction of pyroclastic rocks in Dack Township and the start of the pyroclastic rocks in Bryce and Tudhope Township.

The Skead Group of metavolcanics is exposed in Dack, Beauchamp, Bryce, and Tudhope Townships. The base of this Group is conformable with the top of the Catharine Group. Because the Skead Group is unconformably overlain by Cobalt Group sediments, its total thickness is not known. In Bryce Township, 4480 m of the Skead Group is exposed, revealing the stratigraphy. The group is composed predominantly of pyroclastic rocks with minor basalt flows occurring near the base. Most of the metavolcanics in the Skead Group have calc-alkalic affinities. The top of the Catharine Group and the base of the Skead Group has been intruded by thin gabbro sills which have a high magnesium basalt composition. These may be related to the start of Skead Group volcanism since tuff with a similar composition is found near the base of the Group.

The pyroclastic rocks of the Skead Group are complex. In Bryce and Tudhope Townships, they consist of a chaotic assemblage of pyroclastic breccia, tuff-breccia, lapilli-tuff, lapillistone, and tuff. These rocks are found in thick, massive beds grading into each other. Bedding, although visible, is not prominent. Figure 13 is a map showing the distribution of the pyroclastic rocks in the vicinity of Heather Lake and Honeymoon Lake in Bryce and Tudhope Townships. Northwest of

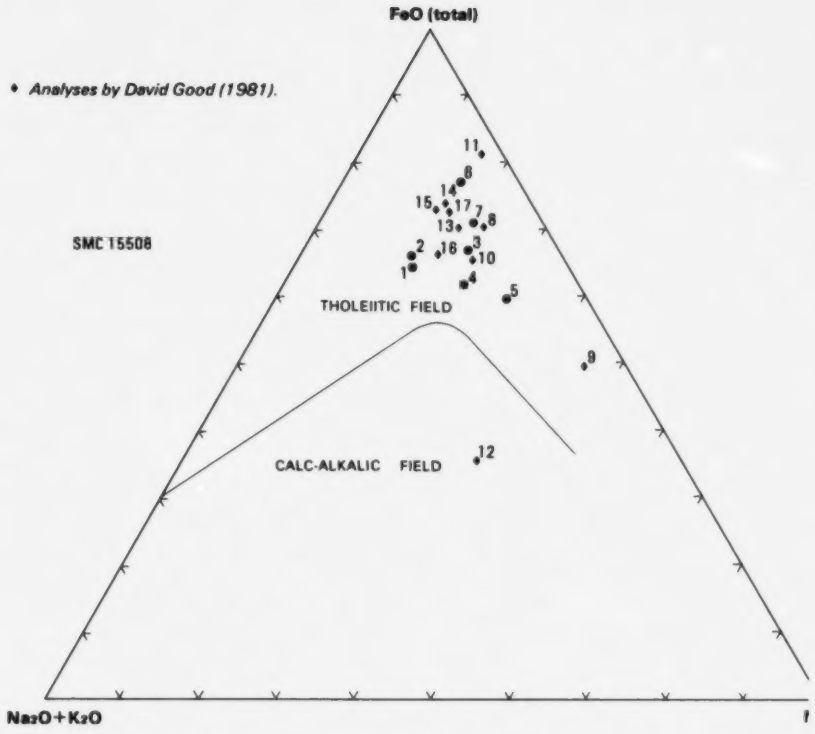

Figure 3. *AFM Ternary Plot (after Irvine and Baragar 1971) of the Catharine Group. (See Figures 8, 9, and 10 for sample numbers).*

Heather Lake and stratigraphically lower in the Group, the pyroclastic rocks are predominantly lapilli-tuff and tuff with isolated horizons or pods of pyroclastic breccia and tuff-breccia. In the area of Heather Lake, very coarse, angular, bimodal pyroclastic breccia predominates and grades laterally into tuff-breccia and lapilli-tuff. Southeast of Heather Lake, intermixed tuff-breccia and pyroclastic breccia predominate with minor pods of pyroclastic breccia found around Pike Lake. Lapilli-tuff, and tuff are interbedded with, and overlie the tuff-breccia. Quartz feldspar porphyry sills intrude the pyroclastic rocks and zones of partial assimilation of the same can be seen within the porphyry. Contacts between the porphyry and pyroclastic rocks can be either sharp or gradational.

In Dack and Beauchamp Townships, the pyroclastic rocks are well bedded, better sorted and, on average, are smaller in clast size than similar rocks in Bryce and Tudhope Townships. The beds have a coarse graded nature to them. In Beauchamp Township, a small porphyritic diorite intrudes the pyroclastic rocks. Fragments of a similar rock type are found in the surrounding pyroclastic rocks. At the same stratigraphic level and above this porphyritic diorite, the pyroclastic rocks are generally pyroclastic breccia and tuff-breccia and grade northeasterly into lapilli-tuff, lapillistone, and tuff. Basalt flows are found within the lower parts of the Skead Group and one of these flows, found in Beauchamp Township, has calc-alkalic affinities.

Chemical analyses alone indicate a trimodal chemical composition for the rocks of the Skead Group. Figure 10 is the Al-Fe-Mg cation plot of the analyzed samples of the Skead Group. Rocks of basaltic composition are both calc-alkalic and tholeiitic. Point number 10 is from a gabbro sill and point number 3 is a tuff and both are tholeiitic. Point number 1 is a basalt flow and point number 6 is a tuff

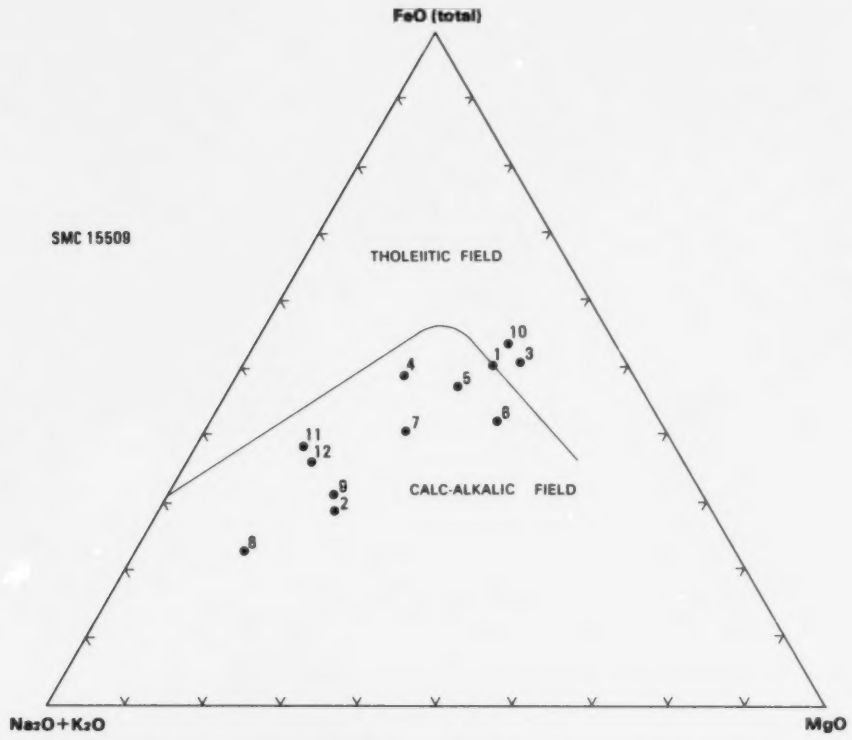

Figure 4. *AFM Ternary Plot (after Irvine and Baragar 1971) of the Skead Group. (See Figures 8, 9, and 10 for sample numbers).*

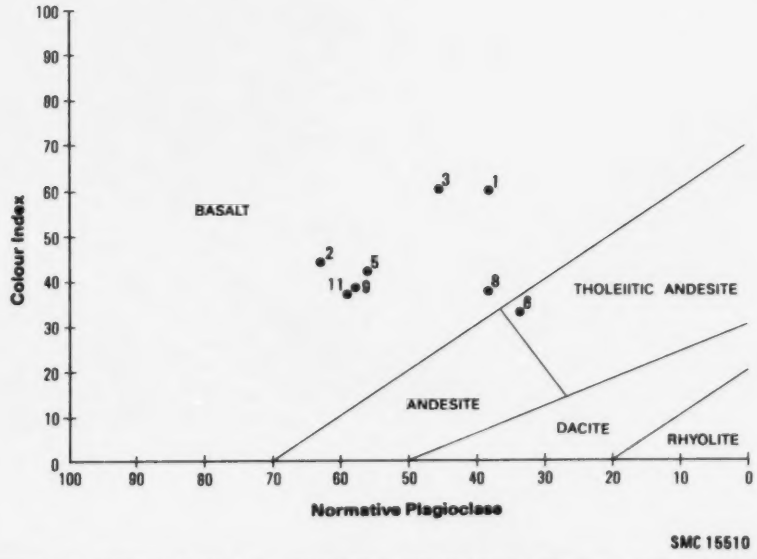

Figure 5. *Colour index vs. normative plagioclase diagram (after Irvine and Baragar 1971) of the Wabewawa Group. (See Figures 8, 9, and 10 for sample numbers).*

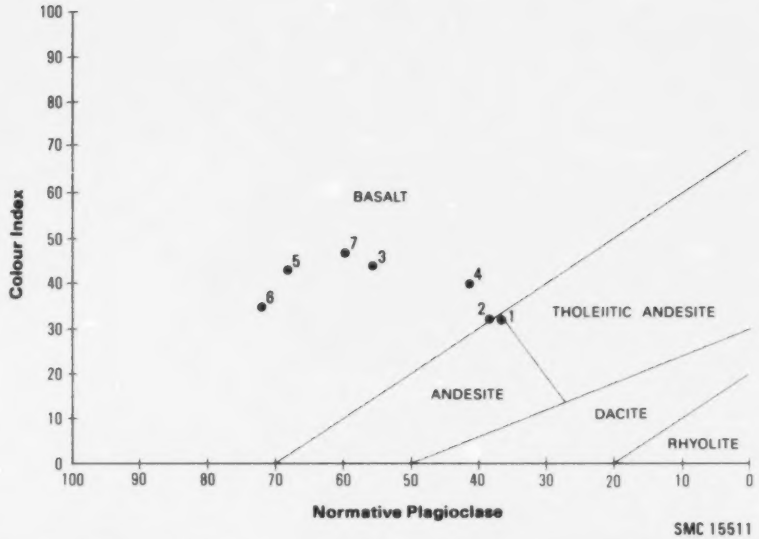

Figure 6. *Colour Index vs. normative plagioclase diagram (after Irvine and Baragar 1971) of the Catharine Group. (See Figures 8, 9, and 10 for sample numbers).*

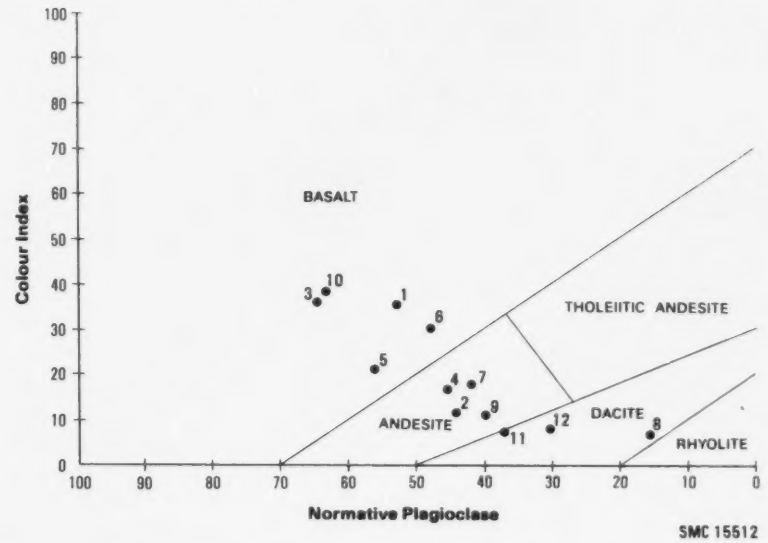

Figure 7. *Colour index vs. normative plagioclase diagram (after Irvine and Baragar 1971) of the Skead Group. (See Figures 8, 9, and 10 for sample numbers).*

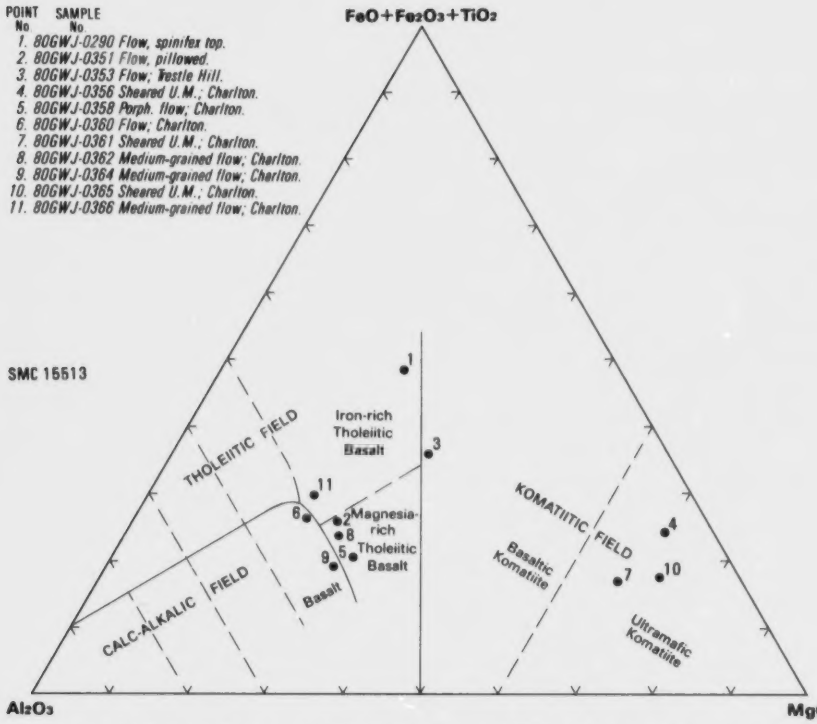

Figure 8. *Al-Fe-Mg Cation plot (after Jensen 1976) of the Wabewawa Group Metavolcanics.*

and both are calc-alkalic. These four points occur in the same general region within Beauchamp and Dack Townships. Calc-alkalic andesite composition rocks plot close together. All these rocks are from the Beauchamp-Dack Townships area. Point number 5 is from the porphyritic diorite that intrudes the pyroclastic rocks. All the analyzed rocks associated with the Skead Group in Bryce Township except for one are calc-alkalic. A finely laminated tuff found on the shore of Honeymoon Lake is chemically a calc-alkalic rhyolite. Point number 9 is from the quartz-feldspar porphyry subvolcanic rock found just south of Honeymoon Lake, and point number 2 is from a clast found in coarse-grained pyroclastic breccia at Heather Lake.

In Bryce and Tudhope Townships, dacitic feldspar porphyry intrusions intrude and alter the pyroclastic rocks. The Britcanna Porphyry (point numbers 11 and 12) plot close to the volcanic and subvolcanic rocks and may be genetically related to the volcanic rocks of the Skead Group.

The more felsic nature of the pyroclastic rocks in Bryce Township would account for their larger average clast size and chaotic appearance. Figure 13, showing the distribution of the pyroclastic rocks, indicates that the vicinity of Heather Lake may have been a centre of explosive volcanism. Subaqueous debris flows as described by Fiske (1963) would account for the lateral and vertical gradation away from the vent area. The close chemical affinity between the subvolcanic quartz-feldspar porphyry just south of Honeymoon Lake and a clast within the pyroclastic breccia at Heather Lake indicates that the porphyry may have been part of a feeder system for the vent forming the pyroclastic breccia.

The more mafic composition of the pyroclastic rocks and attendant extrusive and intrusive rocks in Dack and Beauchamp Townships would explain the average

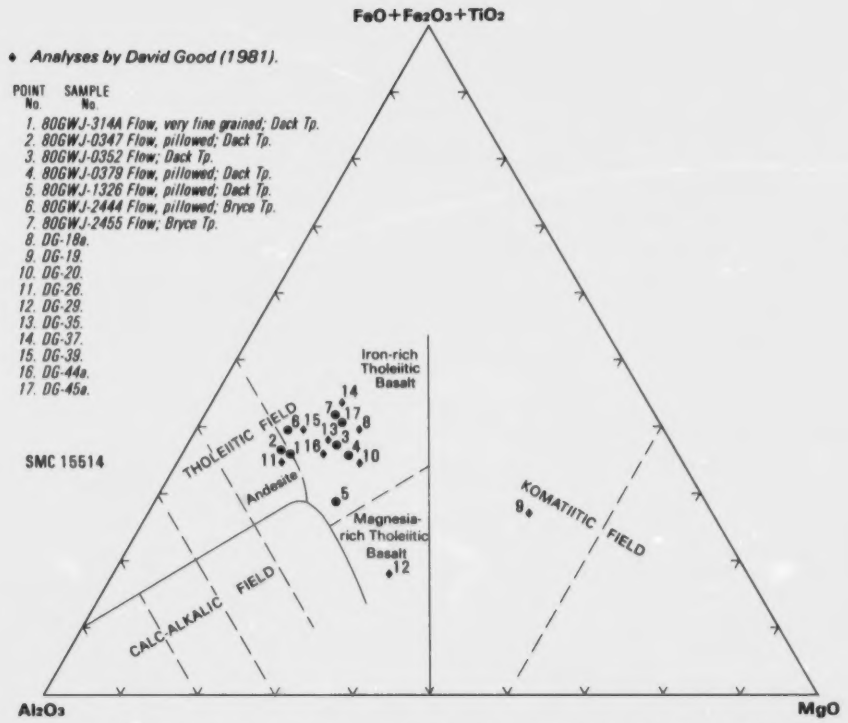

Figure 9. *Al-Fe-Mg Cation plot (after Jensen 1976) of the Catharine Group Metavolcanics.*

smaller clast size for the pyroclastic rocks. The porphyritic diorite found intruding the pyroclastic rocks and included as clasts within the pyroclastic rocks, formed part of a magma chamber feeding the eruptive vent. The well-bedded nature to the pyroclastic rocks, their coarse grading and rough fining up sequences shows that these rocks were formed by subaqueous pyroclastic flows possibly erupted into deep water. The rocks in the Tokiwa Formation in Japan have a similar appearance and have been shown by Fiske and Matsuda (1964) to be the submarine equivalents of ash flows.

The three volcanic groups are composed solely of metavolcanics. Metasediments typical of Archean "greenstone" terrain were not observed during the mapping. The absence of metasediments in the Wabewawa and Catharine Groups may be due to the rapid accumulation of flows in a deep water environment. The Skead Group is composed of proximal facies pyroclastic deposits. Sediments associated with this type of volcanism would be found with distal facies pyroclastic rocks which are not observed in the Hill Lake Area.

Metasediments

Chemical Metasediments

Chert is not common in the map area and is not found as a mappable unit. It is found as discontinuous horizons or lenses up to 5 m long and 30 to 100 cm thick in the mafic metavolcanic flows and in pillow selvages. The weathered surface is a greyish white and the fresh surface is greyish green. Interlaminated with the aphanitic chert are very fine grained felsic tuffs that are not found elsewhere.

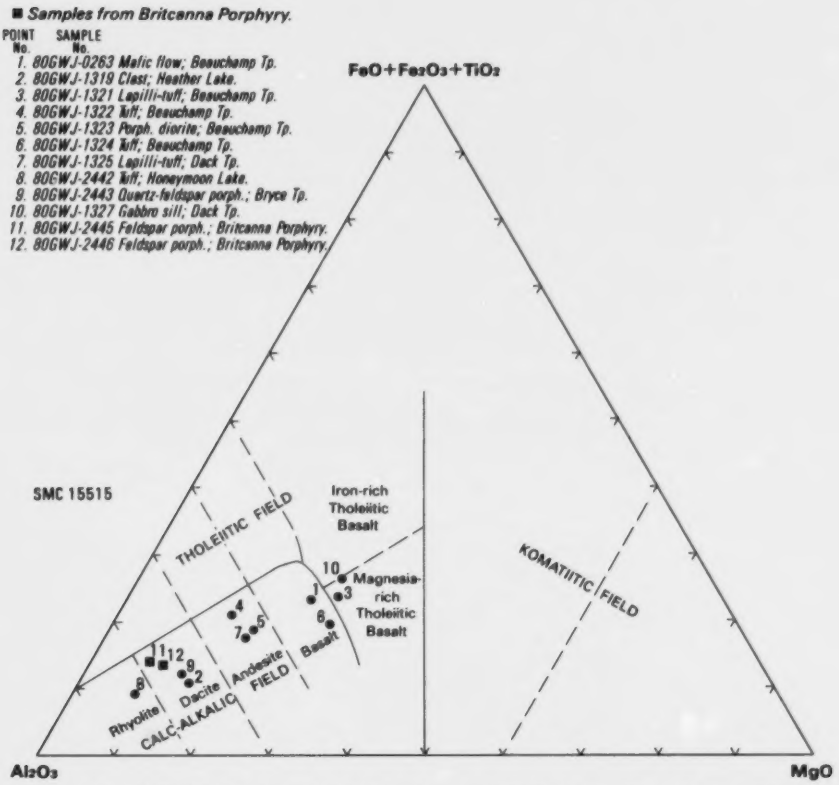

Figure 10. *Al-Fe-Mg Cation plot (after Jensen 1976) of the Skead Group Metavolcanics.*

Charlton Ultramafic Intrusion

The Charlton Ultramafic Intrusion is a 3 km by 400 m ellipsoidal intrusion in the metavolcanics of the Wabewawa Group in the vicinity of the Town of Charlton in Dack and Robillard Townships. The intrusion is only exposed along the shores of the Englehart River and its dimensions have been interpreted by using Geological Survey of Canada Aeromagnetic Maps 1506G and 1494G. The intrusion forms a sill, and the base of the sill intrudes ultramafic metavolcanic flows and the top of it is in contact with mafic metavolcanic flows. The base of the sill consists of a pyroxene-olivine cumulate which is sharply overlain by massive pyroxenite which grades up into melanocratic pyroxene-hornblende gabbro which is then interlayered with leuco gabbronorite at the top of the sill.

The pyroxene-olivine cumulate is classified according to Streckeisen (1976) as a wehrlite. This dark grey, very magnetic medium-grained rock contains round, 0.5 mm olivine pseudomorphs completely surrounded by unaltered augite. A faint layering is observed in the wehrlite. The olivines have been completely altered to antigorite and have a rim of magnetite surrounding them. They constitute an estimated 55 percent of the rock. The augite contains minor talc and chlorite as alteration products and compose 35 percent of the rock.

Dark green, coarse-grained, magnetic pyroxenite overlies the pyroxene-olivine cumulate. The pyroxenite is composed of 85 percent, visually estimated, fresh augite with sharp to corroded boundaries and interstitial material of magnetite and chlorite. The pyroxenite grades up into a black, coarse-grained melapyroxene-

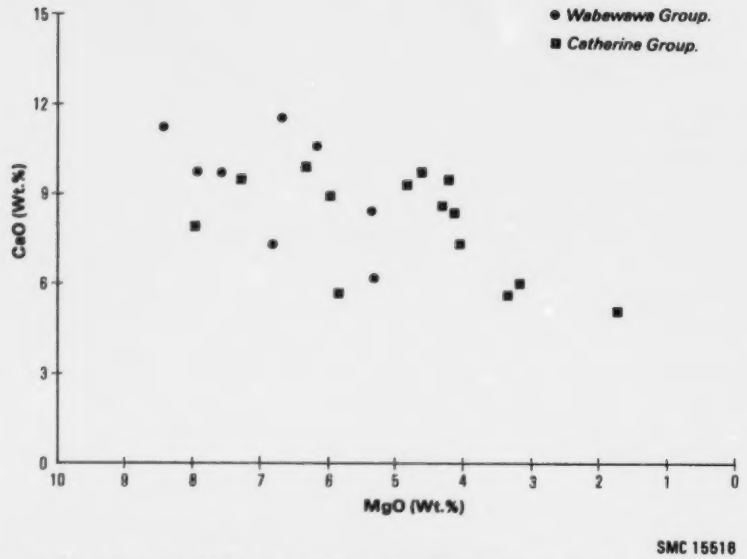

Figure 11. CaO vs. MgO diagram of the mafic flows of the Wabewawa and Catharine Groups. The trend shows the effect on the liquid line of descent by removal of clinopyroxene from the melt (Jackson 2980).

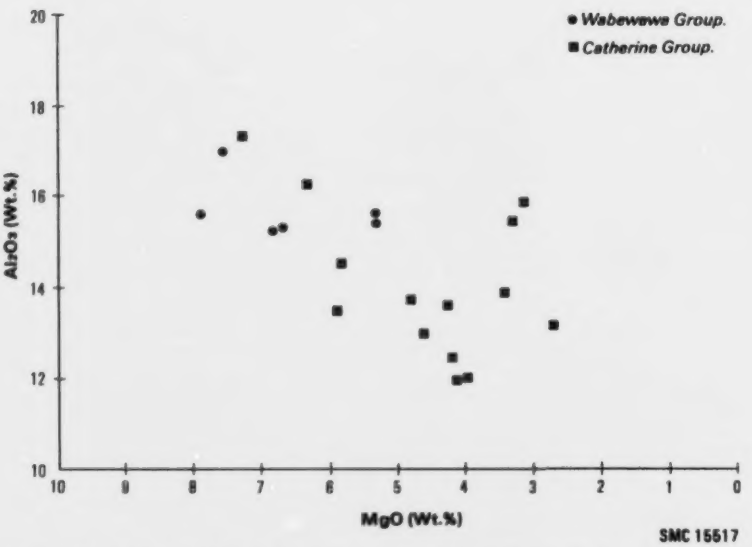

Figure 12. Al_2O_3 vs. MgO Diagram of the mafic flows of the Wabewawa and Catharine Groups. The trend shows the effect on the liquid line of descent by removal of clinopyroxene from the melt (Jackson 1980).

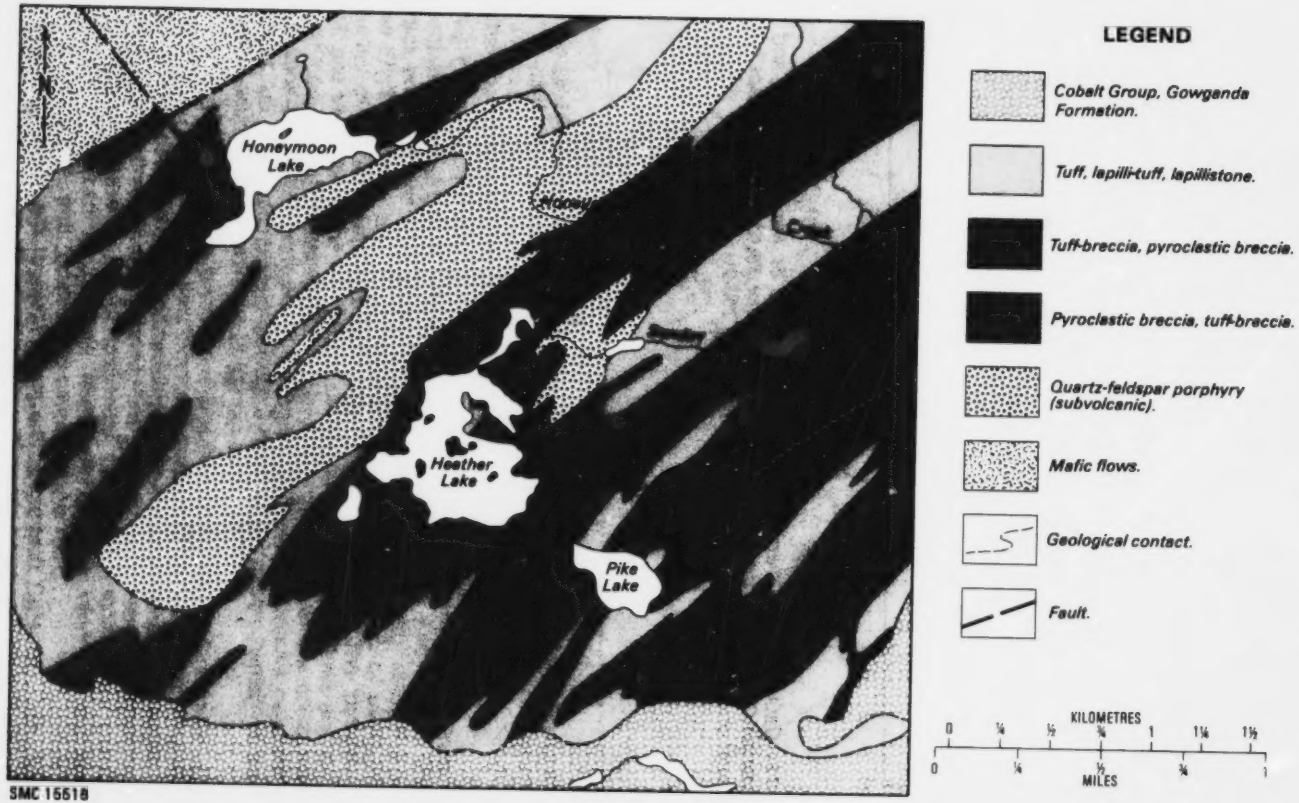

Figure 13. *Sketch map showing the distribution of the pyroclastic rocks of the Skead Group in southern Bryce and Tudhope Townships.*

Photo 2. Layered pyroxenite and leuco-gabbronorite near the top of the Charlton Ultramafic Layered Intrusion.

hornblende gabbro (Streckeisen 1976). Hornblende constitutes an estimated 50 percent of the rock and is found as rims of and complete pseudomorphs of pyroxene. In the gabbro, augite constitutes about 35 percent of the rock, and occurs as relict cores surrounded by the hornblende. Faintly twinned, interstitial plagioclase composes, by visual estimation, 13 percent of the rock and contains minor hematite and magnetite crystals around their rims.

These melanocratic rocks grade progressively into a complexly textured leucocratic pyroxene and hornblende-bearing gabbronorite. This coarse-grained, pink felsic differentiate of the intrusion appears to contain no visible quartz. Dark hornblende- and pyroxene-rich zones occur as splotches and linear bands within the leucocratic part of the rock. Photo 2 taken in Charlton shows the banding which trends N60°E and the leucocratic material is also seen as veinlets and pods within the melanocratic rocks. Extensive, apple green, epidote alteration occurs within the leucocratic parts of the intrusion. A thin section of the leucocratic gabbro-norite contains an estimated 17 percent aphanitic quartzofeldspathic interstitial material and accessory minerals. The large coarse-grained hornblendes are pseudomorphic after pyroxene and the remnant orthopyroxene appears as fine-grained, granular material found between the plagioclase crystals and the quartzofeldspathic material. The andesine plagioclase occurs as long euhedral poikiloblastic laths containing fine-grained hornblende crystals. The interstitial quartzofeldspathic material also contains fine-grained pyroxene and hornblende crystals.

A 38 cm wide olive green, variolitic mafic dike intrudes the sill, but cannot be traced beyond the outcrop on which it occurs. There is a 4 to 6 cm wide chill margin along the contacts and the spherical varioles are 5 mm in diameter.

Metamorphosed Mafic Intrusive Rocks

Metamorphosed mafic intrusive rocks composed of gabbros, diorites, and diabases occur as sills, dikes, and pods intruding the Wabewawa Group, Catharine Group, and Skead Group in Dack, Beauchamp, and Bryce Townships. Gabbro, the most common type of metamorphosed mafic intrusion, occurs within the Wabewawa

Group and the top of the Catharine Group. A small diorite sill or plug is found intruding the Skead Group.

A hypersthene phyric diorite measuring 500 m by 150 m located west of McConnell Rock in Beauchamp Township intrudes the pyroclastic rocks. The intrusive body has a massive, brown weathered surface and a greenish grey fresh surface. Phenocrysts of plagioclase and pyroxene sit in a very fine grained matrix. A visually estimated mode of a thin section of this rock indicates 40 percent oligoclase to andesine phenocrysts, 2 percent hypersthene phenocrysts, 50 percent groundmass, and 7 percent chlorite and epidote. The euhedral, pyroxene crystals are altered to tremolite and carbonate along the crystal boundaries and fractures. Zoned euhedral plagioclase phenocrysts have sharp crystal boundaries, but contain many pits filled with chlorite. The very fine grained groundmass is predominantly feldspathic and also contains chlorite and epidote in altered patches. Lithic fragments found in the surrounding coarse-grained pyroclastic rocks are very similar in appearance to this diorite. The diorite sill may represent a high level magma chamber or a part of a volcanic dome that supplied volcanic detritus to the Skead Group in Beauchamp and Dack Townships.

Northwest of Trestle Hill, a small irregularly-shaped body of medium- to coarse-grained hornblende diorite intrudes the Wabewawa Group. Radiating hornblende crystals are imbedded in a fine-grained matrix of sugary textured feldspar and blue quartz. Coarse-grained hornblende crystals have a feathery radiating habit and are rimmed with and corroded by clusters of a fine-grained aggregate of epidote. Euhedral oligoclase crystals are generally clean, but are pitted with epidote and chlorite. Leucoxene is common in large euhedral crystals.

Gabbro occurs as sills 40 to 100 m in width. Discontinous gabbro sills are found intruding the Wabewawa Group northwest of Trestle Hill in Dack Township and as linear sills intruding the top of the Catharine Group and the base of the Skead Group. These massive gabbros have a smooth weathered, brown surface and a green to dark green fresh surface. They are medium grained, equigranular to inequigranular, porphyritic, and hypocrystalline with feldspar and pyroxene phenocrysts. Xenoliths of mafic metavolcanic material are found in the gabbros northwest of Trestle Hill.

A gabbro sill intruding the Skead Group in Dack Township contains large, subrounded feldspar phenocrysts in layered zones. This 100 m thick sill has a basal chilled margin 1.6 m thick which is overlain by a 0.9 m thick porphyritic horizon containing subrounded plagioclase phenocrysts 2 to 4 cm in diameter grading southeast into a 1.7 m zone containing scattered phenocrysts (Photo 3). Above this zone is a 2 m thick section containing subparallel layers of feldspar phenocrysts up to 5 cm in diameter. The remaining part of the sill is massive, equigranular, and medium grained. In the equigranular part, euhedral laths of andesine are becoming saussuritized, but still retain uncorroded crystal boundaries with clean uncorroded augite crystals. One of the inequigranular sills is composed of very fine grained feldspars which are being altered to epidote and chlorite along with phenocrysts of euhedral to subhedral augite laths which have clean borders with minor alteration to chlorite and actinolite in their cores. Plagioclase occurs as small saussuritized subhedral grains. Quartz is present as anhedral crystals within the groundmass. Interstitial cavities filled with chlorite and euhedral quartz are found within the gabbros. The chlorite may represent altered basaltic glass giving the gabbros a hypocrystalline texture. Finer grained parts of these gabbros have diabasic textures with clean euhedral augite and completely saussuritized plagioclases.

In Bryce Township, highly altered, medium-grained gabbro dikes and a fine-grained diabase intrude the Skead Group metavolcanics. A 6 to 9 m wide medium-grained, quartz-bearing gabbro found south of Heather Lake weathers brown. This rock has been saussuritized, carbonatized, and silicified. The original mafic minerals have been totally replaced by a fine-grained aggregate of chlorite, carbonate, and feldspar. Pseudomorphic feldspar consists of very fine grained epidote and saussurite. Anhedral quartz and granophyric quartz is common. The finer grained diabasic dikes are dark green and highly altered. The most common mineral is

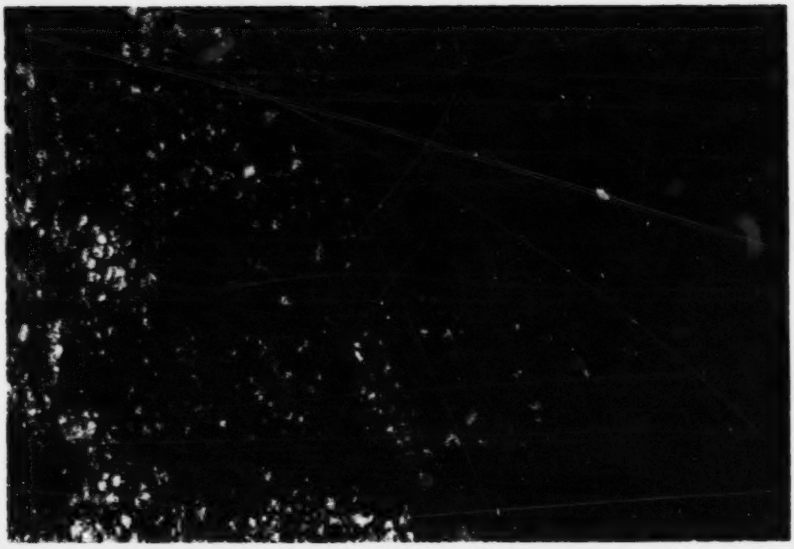

Photo 3. *Porphyritic base of a gabbro sill intruding the basal Skead Group metavolcanics in Dack Township.*

actinolite occurring as fine-grained cross-sections and flakes within a matrix of chlorite and feldspar. The primary feldspars have been completely saussuritized. Epidote commonly occurs as veinlets and masses crosscutting foliation. Minor quartz is interstitial and evenly distributed.

Metamorphosed Felsic to Intermediate Intrusive Rocks

Metamorphosed felsic to intermediate intrusive rocks are found within the western part of the map area. Feldspar porphyry is the most common type occurring as discordant plugs as well as narrow dikes. Quartz porphyry, quartz-feldspar porphyry, feldspar-quartz porphyry, and felsite are all found as narrow dikes and small plugs intruding the Catharine and Skead Groups in Bryce and Tudhope Townships.

These dikes appear to be related to larger feldspar porphyry plugs, such as the Britcanna Porphyry. Many dikes are found north and west of the Britcanna Porphyry which is located in the central part of Bryce Township. In southwestern Bryce Township and southeastern Tudhope Township, a preponderance of dikes and small plugs are found intruding highly sheared and carbonatized Skead Group metavolcanics. The highly disturbed nature of the metavolcanics indicates that another large feldspar porphyry plug may underlie them and may have acted as a magma source for the exposed dikes and plugs.

Quartz porphyry is found as narrow dikes in the vicinity of Heather Lake in Bryce Township. These dikes are highly sheared, are about 20 m thick, and trend northwest parallel to local schistosity. They contain phenocrysts and glomerophenocrysts of rounded, internally shattered quartz ranging from 3 to 5 mm in size set in a very fine grained, pale green, aphanitic matrix. The planes of foliation undulate around the quartz phenocrysts.

Feldspar porphyry, as used in the context of this report, includes all intrusive feldspar phyric rocks having a variable composition range. The largest exposure of feldspar porphyry is an irregularly-shaped, oval plug of dacitic composition 2.8 km by 1.7 km intruding the Upper Catharine Group and Lower Skead Group metavolcanics in Bryce Township. The intrusive body has been called the Britcanna Porphyry by Moorhouse (1944). Narrow dikes intrude the Catharine Group and Skead Group.

The dikes range in thickness from less than 1 to 20 m with sharp, linear contacts that are either subparallel to foliation or oblique to foliation. These dikes generally have a white weathered surface and a fresh surface that ranges in colour from light green to green. Euhedral to subhedral feldspar phenocrysts, 6 mm or less in size, are found within a very fine grained to aphanitic, dense matrix. Dikes with a fine-grained hornblende-rich matrix are found. The dikes are generally massive, but the occasional highly schistose dike is seen.

The Britcanna Porphyry itself is typified by a white weathered, hackley to schistose outcrop surface. The fresh surface is pale green to dark grey in which white euhedral to subhedral to broken feldspar phenocrysts are seen. These feldspar phenocrysts range in size from 1 to 4 mm and make up an estimated 15 and 50 percent of the rock. The intrusion is highly sericitized and carbonatized, this makes the macroscopic features less well defined. Minor, highly resorbed xenoliths of a more mafic composition have been seen in thin section, but are not common.

The Britcanna Porphyry is highly altered. Its chemical composition, as given in Table 2, is close to that of an average dacite. Major oxides do not appear to have been added or deleted in the alteration process.

Quartz-feldspar porphyry dikes contain subhedral to anhedral, embayed quartz crystals and quartz intergrown with the plagioclase crystals. They generally appear to be less altered than their feldspar porphyry counterparts and are not as common. Their groundmass is very fine grained and quartzofeldspathic.

Felsite dikes have a pink weathered surface and a grey fresh surface. They are fine grained, equigranular to inequigranular, and are fresher in appearance than the porphyries. Thin laminar flow banding has been observed next to their contacts in some of the felsic dikes. Felsite is seen intruding both the metavolcanics and the Britcanna Porphyry.

In thin section, the metamorphosed felsic to intermediate dikes show intense alteration. The original mineralogy, for the most part, has disappeared. Feldspar phenocrysts are, for the most part, totally altered to sericite and epidote with chlorite clots. A few phenocrysts are corroded albite and oligoclase crystals which have been partly altered. Amphibole pseudomorphs, consisting of chlorite and epidote clots are the predominant mafic phenocryst. Needles of hornblende delineating the foliation are also observed. Quartz, a minor component in most dikes, occurs as small anhedral grains within the groundmass and as wormy intergrowths with the less altered feldspars. The groundmass of the dike rocks varies from being fine grained to being aphanitic quartz and feldspar. Alteration is intense with large patches of the groundmass consisting of granular epidote, carbonate, and sericite as well as interstitial chlorite.

Metamorphism of the Metavolcanics

The metamorphic grade of the Early Precambrian rocks within the map area ranges between subgreenschist facies and amphibolite facies. These are the zones 2 and 4 of Jolly (1978), he has studied the metamorphism of the Abitibi Belt east of the Kapuskasing High. Metamorphic zoning within the map area progresses from amphibolite facies next to the Round Lake Batholith through a narrow greenschist facies zone to subgreenschist facies. A high degree of carbonate alteration has been superimposed on the lower grade metavolcanics found in the vicinity of Heather Lake in Bryce Township.

The zone of amphibolite facies metamorphism can be traced approximately 1.6 km from the contact with the Round Lake Batholith (Good 1981). The metavolcanics found within this zone become progressively more foliated and recrystallized as the contact is approached. The mineralogy in the amphibolitized mafic metavolcanics consists of hornblende + plagioclase + epidote + quartz + apatite + magnetite.

The greenschist facies rank metamorphism around the Round Lake Batholith has overprinted the regional subgreenschist facies rocks (Jolly 1978). These rocks are slightly foliated and retain many of their primary features. The mineral com-

position of these mafic metavolcanics are actinolite + chlorite + hornblende + epidote + plagioclase + stilpnomelane + quartz + magnetite.

Most metavolcanics are within the zone of subgreenschist facies rank metamorphism. These rocks are neither foliated nor penetratively deformed, and thus retain all their original structure and textures, even the most delicate of features. The main effect of this low grade metamorphism has been the complete alteration of the plagioclase to saussurite. These metavolcanics consist of pyroxene (augite and hypersthene) + plagioclase + chlorite + actinolite + carbonate + epidote + stilpnomelane + quartz + palagonite + muscovite. Chlorite occurs as vesicle fillings and displays anomalous blue birefringence. Remnant glass has been identified. The best preserved of the low grade rocks are found in southern Dack and northern Beauchamp Townships. Pervasive carbonate alteration and schistosity have affected the metavolcanics in Bryce and Tudhope Townships.

Felsic to Intermediate Intrusive Rocks

The southeastern part of the Round Lake Batholith outcrops in the northern and western parts of the map area and consists of tonalite to trondhjemite, granodiorite, aplite, and diorite. Jean Lafleur has mapped the Round Lake Batholith for the Geological Survey of Canada (Lafleur 1981; Card *et al.* 1981).

That part of the Round Lake Batholith exposed within the map area can be subdivided into three phases: a foliated to cataclastic tonalite with trondhjemitic and granodioritic parts; a massive granodiorite stock intruding the tonalite south of Thin Lake in Tudhope Township, and aplite dikes and veins intruding both the tonalite and granodiorite. The granodiorite intruding the tonalite has been designated the Hope Lake Stock by Lafleur (1981). Figure 14 is a QAP ternary plot showing the distribution of intrusive rock types within the batholith.

Intrusive relationships with the metavolcanics have been recorded by the field party for both the tonalite and granodiorite except in the northeastern corner of Dack Township where the tonalite is in fault contact with the metavolcanics of the Wabewawa Group. The foliation exhibited by the Round Lake Batholith within the map area has an east-northeast trend except near the contact with the metavolcanics where it is parallel to subparallel to the contact.

Foliated tonalite to trondhjemite comprises the dominant phase within the map area and is fairly uniform in character. It is a medium- to coarse-grained rock with a greyish white weathered surface and a grey fresh surface. Equigranular plagioclase, quartz, hornblende, and biotite are the major rock forming minerals. Hornblende is the predominant mafic mineral with biotite commonly found in varying amounts throughout the tonalite. The foliation is defined by oriented hornblende, biotite, and by granulated quartz.

Xenoliths of mafic metavolcanic amphibolite gneiss are commonly found near the contact zone with the metavolcanics and increase in number as the contact is approached. Photo 4 shows angular, sharp bordered mafic metavolcanic xenoliths within massive tonalite near the contact with the metavolcanics. The batholithic material forms thin dikes and apophyses and sills within the metavolcanics.

The plagioclase feldspars are highly altered to sericite with small granules of epidote. These feldspars, concentrically zoned, are in the upper oligoclase to andesine composition range and constitute 40 to 55 percent of the rock. Quartz, the next most abundant mineral, occurs in mosaic patterned aggregates subparallel to the foliation and composes 25 to 35 percent of the rock. Hornblende, composing 10 to 18 percent of the rock, occurs in relatively fresh, columnar sections and cross-sections. Alteration of the hornblende ranges from chloritic rims to chlorite patches throughout the crystal. Biotite, composing up to 5 percent of the rock, occurs as aggregates and isolated grains, generally separate from the amphibole. Bleaching of the amphiboles has been observed where the amphibole is in contact with biotite. Opaque minerals occur in amounts up to 2 percent of the rock and are found as tiny subhedral grains or concentrated dust within hornblende.

A 700 m thick zone of cataclastic tonalite is found in northwestern Dack Township. Lafleur (1981) has noted this zone occurring along the eastern edge of

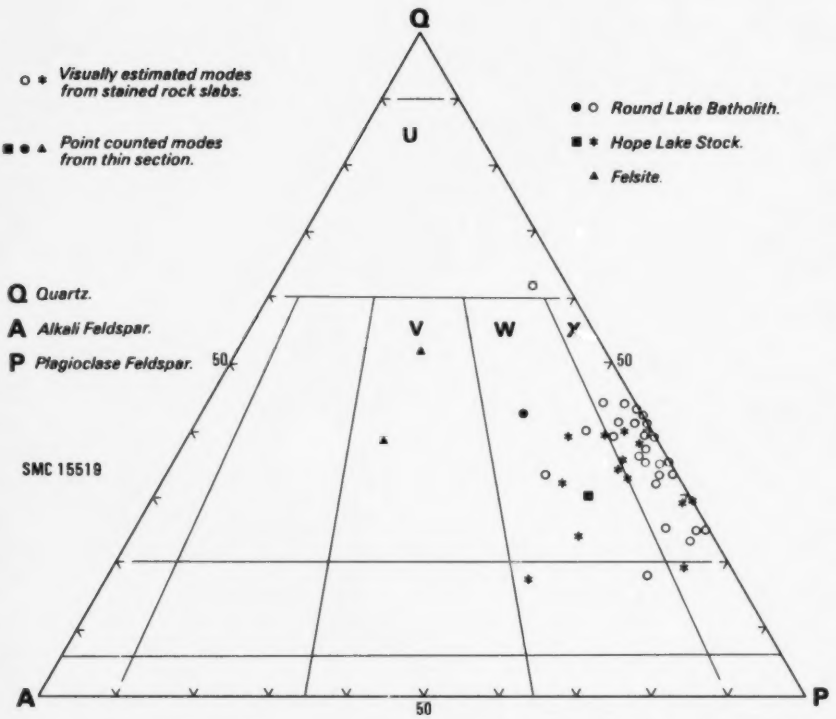

Figure 14. Modal composition of the Round Lake Batholith plotted on Streckeisen's (1976) QAP diagram. (V, Granite or quartz monzonite; W, Granodiorite; X, Tonalite; U, quartz-rich granitoid).

the Round Lake Batholith as far as Tarzwell near Round Lake. The cataclasis is most pronounced next to the contact with the highly schistose mafic metavolcanics and decreases in intensity away from the contact. A sharp contact was noted between the foliated tonalite and the cataclastic tonalite and some of the foliated part appears to intrude the cataclastic part. Within the cataclastic zone, the plagioclase feldspars consist of broken to rounded grains that range down in size from <8 mm. White to grey vitreous quartz is smeared parallel to the cataclasis and totally encloses the feldspar grains. Undeformed quartz occurs in stockwork zones up to 8 m thick and in large pods. Throughout the rest of the area, narrow mylonitic horizons, resembling gneiss in appearance are seen in tonalite.

The Hope Lake Stock is an oblong shaped intrusion situated south of Thin Lake in Tudhope Township. This stock intrudes both the metavolcanics and the foliated tonalite. Adjacent to the Hope Lake Stock, predominantly east-trending structures in the metavolcanics have been reoriented to a northerly direction.

The stock is composed of massive, pink, medium-grained, knobby textured, inequigranular granodiorite. Plagioclase feldspars are pink, anhedral to subhedral, and are surrounded by rims of potassic feldspar. Anhedral grains of quartz, with thin hematite rims are coarser than the feldspars and range up to 1 cm in size. These quartz grains weather high and give the outcrops a knobby texture.

The plagioclase consists of strongly zoned, twinned, albite laths which are strongly sericitized. The quartz grains are composed of mosaics of smaller anhedral crystals. Microcline is found as fine, subhedral, unaltered grains interstitial to the plagioclase. Amphibole is seen in columnar sections, as well as being

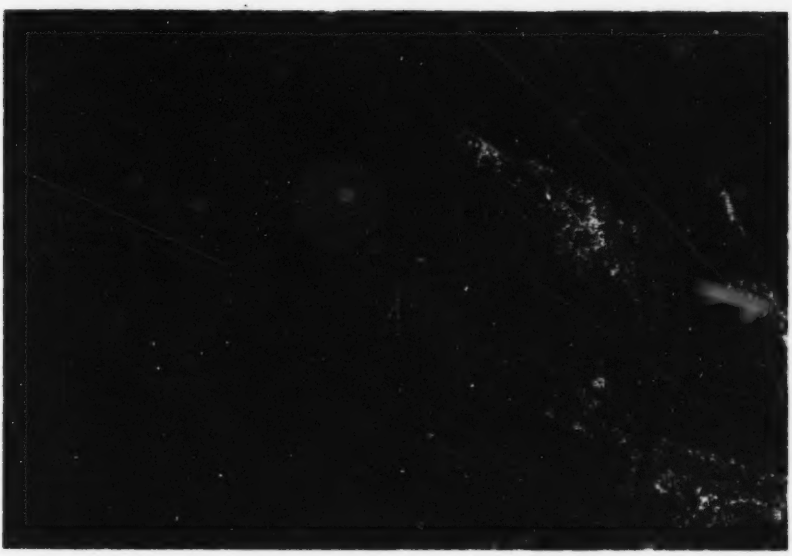

Photo 4. *Angular metavolcanic xenoliths found within the Round Lake Batholith near the contact with the metavolcanics.*

interstitial to the feldspars. Biotite is not as common and is found altering to chlorite. Zircon, surrounded by a radioactive halo, is seen in some of the biotite crystals.

Both the foliated tonalite and Hope Lake Stock granodiorite are cut by pink to grey, fine-grained aplite dikes. The aplites are composed of plagioclase, quartz, and microcline. The plagioclase feldspars are zoned and sericitic alteration outlines the zoning. The rims of some of the less altered feldspars have myrmekitic textures. Quartz forms anhedral grains interstitial to the feldspar. Microcline is the common alkali feldspar showing well-developed perthitic twinning.

The southern part of Robillard Township, between the Round Lake Batholith and the Cross Lake Fault, is underlain by highly metamorphosed and recrystallized mafic metavolcanics with veins, lenses, and irregularly-shaped bodies of contaminated tonalite, diorite, tonalite, and aplite. The diorite and contaminated tonalite have not been found within the main body of the Round Lake Batholith.

The diorite and contaminated tonalite are dark grey varied textured rocks which have both intrusive and gradational contacts with the mafic metavolcanics. Tonalite and contaminated tonalite are seen along joints and pillow selvages within the recrystallized metavolcanics. Diorite may show distinct banding and is seen to grade into both tonalite and the mafic metavolcanics. Definite intrusive relationships are seen where diorite contains rounded, partly resorbed xenoliths of metavolcanics and where diorite has sharp contacts with the host rock. Photo 5 shows distinct, ellipsoidal xenoliths that have gradational boundaries in diorite which has a sharp contact with the metavolcanics.

Diorite is fine to medium grained, and has grain sizes varying within hand size samples. Subhedral to feathery hornblende and highly sericitized and saussuritized feldspars constitute 10 to 70 percent of the diorite. Chlorite occurs as an alteration product of hornblende and is found as fibrous clusters. Anhedral quartz grains form an equigranular mosaic interstitial to the feldspars and are normally less than 15 percent of the rock. Apatite, epidote, ilmenite, leucoxene, sphene, and opaque minerals are found as accessories.

Good (1981) noted, upon plotting whole rock chemical analyses of all rock types of this area, that the diorites and other contaminated tonalites were calc-

Photo 5. *Rounded partly resorbed xenoliths of metavolcanic rock found within the contaminated tonalite in Robillard Township.*

alkalic in nature and fell between compositional ranges of tonalite and tholeiitic mafic metavolcanics. The diorites and contaminated tonalites invariably plotted close to the uncontaminated tonalite. Field, petrologic, and chemical evidence indicate that the diorites and contaminated tonalite are the result of the mixing of a tonalitic magma and a minor amount of mafic metavolcanic country rock.

Mafic Alkalic Intrusive Rocks

Dikes of mafic alkalic intrusive rocks intrude all rocks throughout the map area that are of the same age or older than the Round Lake Batholith. Although these dikes have been subdivided into only two categories in the field, petrographically they are seen to be more diverse. The two field categories are pebble -bearing and non-pebble -bearing lamprophyre.

Macroscopically, the two lamprophyres have fine-grained phases which have a similar appearance. They have a dark reddish grey fresh surface and a light brown, even textured weathered surface. The phyric phases of the lamprophyres consist of biotite, amphibole, or pyroxene up to 1 mm in diameter. Pebble lamprophyres contain subrounded gneiss, granodiorite, and volcanic clasts up to 30 cm long with their long axes oriented parallel to the contact of the dike. Photo 6 is of a 5 to 6 m wide pebble lamprophyre in the Britcanna Porphyry in Bryce Township. Both the pebble and non-pebble lamprophyres occur in recessively weathered dikes with sharp contacts and range from 0.5 to 6 m in width and cannot be traced beyond the outcrop in which they occur.

Two ages of lamprophyre dikes are possible. In the structurally contorted metavolcanics found in northeastern Dack Township, a strongly foliated lamprophyre was noted, while a non-foliated massive lamprophyre occurs in the cataclastic tonalite. Petrographically, some lamprophyres were seen to be more altered than others.

The phyric phases observed within thin sections of some of the lamprophyre dikes include, by visual estimation: 60 percent biotite; 60 percent zoned augite; 30 percent of equal amounts of hornblende and augite, and 20 percent chlorite, pseudomorphic after amphibole. The matrix is a very fine grained to fine-grained, equigranular mixture of feldspar, chlorite, quartz and opaque minerals. The mafic

Photo 6. *Pebble lamprophyre found intruding the Britcanna Porphyry in Bryce Township.*

minerals that are found within the matrix of any one dike are the same as the mafic phenocrysts found in the same dike. Carbonate alteration ranges from minor to pervasive throughout various dikes.

Unmetamorphosed Mafic Intrusive Rocks

Unmetamorphosed mafic intrusive rocks consist of late Early Precambrian diabase-textured dikes found predominantly in the western part of the map area. These dikes ranging in width from a few m to 40 m trend northwest, north, and northeast. Generally, they cannot be traced for great distances. An exception to this is a northeast-trending dike intruding the Catharine Group in Tudhope and Bryce Townships which can be traced intermittently for 3.6 km.

The rocks have a brown to buff brown, smooth weathered surface and a dark greenish grey fresh surface. They are massive, fine to medium grained, inequigranular crystalline, fresh in appearance, and slightly magnetic. A very fine grained, magnetic dike in southwestern Truax Township contains 5 percent pale green feldspar phenocrysts up to 5 mm in diameter. The contacts between the dikes and the host rock are sharp, linear, and vertical.

Augite, the common mafic mineral, varies from subhedral to euhedral, and is fresh with few or no reaction rims. Chlorite is found in lesser amounts as anhedral clots. Plagioclase feldspars are found as euhedral, highly saussuritized laths. Quartz is a minor constituent and occurs as anhedral grains. Granophyric textures are also found. Skeletal magnetite is the common opaque mineral.

MIDDLE PRECAMBRIAN

Huronian Supergroup

Cobalt Group

Rocks of the Cobalt Group are found along the southern margin of the Archean outcrop area. Sediments of the Gowganda Formation are in unconformable contact with the Archean rocks. The Lorrain Formation is only found in central Tudhope Township and no contact relationship has been recorded by the field party with the underlying Gowganda Formation. The contact with the Archean rocks has, in

places, been affected by post depositional faulting. Slickensides and sheet quartz have been observed along the fault plane in the contact zone.

The Cobalt Group sediments have been subjected to diagenesis only. The matrix and clasts commonly contain white mica and clay minerals as the only secondary phase. Where these sediments have been intruded by the Nipissing Diabase, they have been recrystallized and have a pronounced granoblastic texture near the contact with the diabase.

Gowganda Formation Within the map area, the Gowganda Formation may be subdivided into an upper and lower part which are not correlatable to the upper and lower parts seen in the Cobalt area. As seen in Figure 15, the lower part in the Hill Lake area consists of matrix-supported and clast-supported conglomerate with interbedded wackes, arenite, and red and green argillite while the upper part consists of red and green argillite with minor interbedded arenite and matrix-supported conglomerate. Argillite is called mudstone in the legend of Map 2501, back pocket, and is also called mudstone in the table of lithologic units, Table 1. Red coloured argillite is found at the base of the Gowganda Formation in the Hill Lake area, and it is reported to occur at the base in the Larder Lake area as well (Wood 1979). Southeast of the current map area in the Firstbrook Lake area (Johns 1980; 1985), the red beds do not appear until well up in the sequence. If the red sediments are a time stratigraphic horizon as suggested by Wood (1980), the sediments of the Gowganda Formation in the map area are younger than those found in the Coleman Member of the Cobalt area and are of the same age as those found in the Larder Lake area.

The matrix-supported conglomerate forms a moderately dipping, relatively thin deposit in Bryce and Beauchamp Townships and a thicker deposit in Tudhope and Truax Townships. Clast-supported conglomerate is found in topographic lows on the Archean basement in Bryce Township.

The matrix-supported conglomerate is massive, unbedded, highly unsorted, polymictic with a brown weathered surface, and has a dark green fresh surface. The matrix in this conglomerate varies from lithic grit to lithic wacke to red silt and argillite. Lithic clasts are composed of subrounded to rounded, intermediate metavolcanics, mafic metavolcanics, granitic rocks, and minor amounts of ferruginous chert. The metavolcanic clasts are more numerous than the granitic clasts and are generally less rounded. The roundness of the clasts also decreases as the contact with the Archean is approached. At some localities, the clasts adjacent to the contact are subangular to subrounded and are up to 1 m in diameter. Average clast size ranges from boulder to granule. Clasts make up from less than 15 to 30 percent of the rock. The conglomerate is mainly derived from local sources.

The clast-supported conglomerates are poorly sorted, matrix-poor rocks composed predominantly of metavolcanic clasts. Clasts size ranges from granule to pebble size; the smaller clast sizes predominate. The matrix is a dark green chloritic clayey siltstone.

Thick to thin laminated, red argillite overlies the conglomerate in the southern part of Bryce Township. Red argillite is also observed in contact with the Archean basement. Both the weathered surface and the fresh surface of these rocks are dark red with subordinate coarser grained chlorite-rich beds distributed throughout. Towards the base of these argillites, 2 to 3 cm thick horizons of undulating interbeds of lithic wacke and red wispy shale are found interbedded with the argillite. Pebbly argillite also occurs in lenses near the base of the red argillite with 10 percent angular granitic clasts occurring in a red silty argillite matrix. Dropstones consisting of granitic clasts were also seen deforming the laminae in silty argillite. The argillites are composed of poorly sorted, silt size, subangular quartz and feldspar within a hematite and clay matrix. Detrital biotite laths are found subparallel to the bedding plane. The undulating, thickly laminated wackes contain rounded quartz, subangular feldspar, and lithic grains in a chlorite matrix.

Thickly laminated, green-grey argillite occurs in contact with the Archean basement and interbedded with the conglomerate higher up in the sequence. The weathered surface is pale buff and the fresh surface is dark green-grey. The

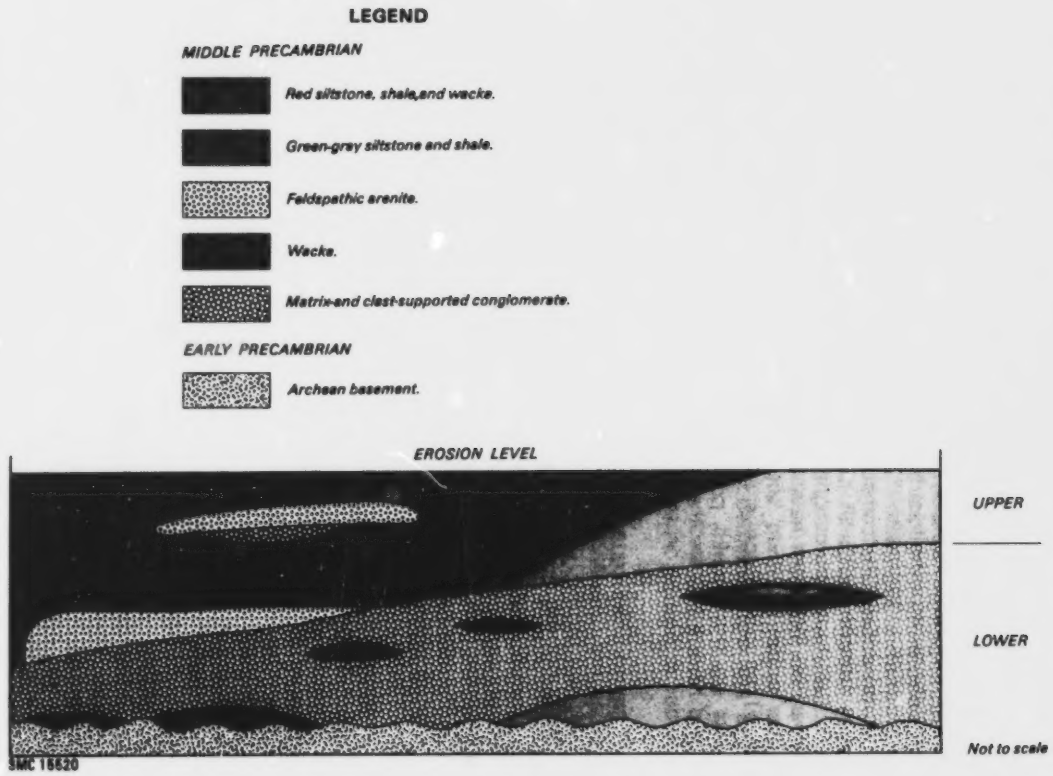

Figure 15. *Schematic longitudinal section of the Gowganda Formation exposed in Bryce Township.*

argillite is thickly laminated, massive, and poorly sorted. Angular 1 mm sized quartz fragments and rare amounts of granitic pebbles are set in a very fine grained siliceous clay matrix.

Feldspathic and lithic arenite is found in Bryce Township interbedded with the conglomerates of the lower part of the Gowganda Formation; along the upper contact with the Nipissing Diabase, and interbedded with the red argillite of the upper part of the formation. Arenite occurs in minor amounts as tabular beds and channels within the conglomerate. A wedge of arenite overlies the conglomerate; the bedding thickness and the sorting increase in a westerly direction. The arenites are red to greyish red on both the fresh and weathered surface. Grain size varies from medium grained to fine grained. The arenite beds are graded with a thin horizon of red argillite occurring at the top of each bed. The rocks are metamorphosed next to the contact with the Nipissing Diabase; chlorite spotting starts to appear here. The quartz, feldspar, and lithic grains are subangular to rounded and are moderately sorted. The quartz grains generally are more rounded than the feldspars and lithic fragments. The feldspar and lithic fragments have similar degrees of roundness. The composition of the arenites is variable, ranging from lithic rich to feldspar rich with a high percentage of quartz in all types. Large xenoliths of red arenite are caught up in the diabase and are highly recrystallized. The grains in the inclusions have a granoblastic texture, and are in the 0.25 to 1 mm diameter range.

Wackes are found interbedded with the conglomerates in Bryce Township. These rocks are fine grained, poorly sorted, massive with a greyish green fresh surface, and have a buff weathered surface. Chloritic spotting has been observed in the outcrops in the east central part of Bryce Township.

Lorrain Formation The Lorrain Formation, composed primarily of feldspathic arenite, overlies the Gowganda Formation in Tudhope Township. The arenites are unaltered except in the western part of the township where they have been metamorphosed by the intrusion of the Nipissing Diabase sill.

The Lorrain Formation within the map area is uniform in appearance having a pink to maroon weathered and fresh surface. The arenites are medium bedded and are generally fine to coarse grained. The quartz, feldspar, and lithic fragments are subangular to subrounded and the matrix is composed of very fine grained material altering to sericite. Crossbedding has been observed and is enhanced by dark, heavy mineral banding.

Grit to pebble conglomerate is found in indistinct horizons and pods at the base of some arenite beds. The pebbles are composed of quartz and granitic material which are well rounded and in the 4 to 64 mm size range. The matrix of the conglomerate is similar to the feldspathic arenite that constitutes most of the formation. There is no distinct contact or boundary between the arenite and the grit to pebble horizons.

A 3 m wide breccia dike containing angular, poorly sorted metavolcanic and sedimentary clasts intrudes the Lorrain Formation in southern Tudhope Township. The angular clasts range in size from 0.2 to 15 cm and are composed of mafic metavolcanics, fine-grained dark green wackes and siltstone, buff cherty siltstones, and minor granitic clasts. The matrix is an unsorted wacke with angular grains in all size ranges. The sedimentary clasts are similar to rocks found within the Gowganda Formation. The dike trends northwest, subparallel to the Montreal River Fault. It may be related to, or caused by the tectonics responsible for the Lake Timiskaming Rift Valley.

The arenite of the Lorrain Formation has been recrystallized west of Thin Lake in Tudhope Township. The quartz and feldspar grains have partly grown together leaving a matrix of fine sand sized matrix. The recrystallization is due to contact metamorphic affects of the intrusion of a Nipissing Diabase sill.

Sedimentary Environment - Cobalt Group Figure 15 is a schematic longitudinal section of the Gowganda Formation in Bryce Township. The Gowganda Formation sediments were deposited in a fluvial and lacustrine environment related to the glaciers that deposited the Coleman Member in the Cobalt area. Along the contact with the Archean rocks, argillite and wackes are found along with the conglomerate. The finer grained sediments indicate that a quiet environment existed before the onset of sedimentation of the coarse-grained rocks. The fluvial activity which deposited the conglomerates along with the interbedded wackes eroded most of the pre-existing sediment away and left the thick massive sequence of coarse-grained matrix- and clast-supported conglomerate behind. The matrices of the conglomerates range from wacke to argillite.

Localized fluvial environments are indicated by the feldspathic arenites that are found on top of the conglomerate. The thickly laminated to thinly bedded siltstones, shales, and wackes were deposited in a lacustrine environment on the edge of a deep basin that is found to the south of the Archean outcrop (Thomson 1966). The fine-grained sediments are red, similar to the upper part of the Firstbrook Member of the Gowganda Formation in the Cobalt area (Johns 1980). These sediments are not the equivalent of the Firstbrook Member because they contain interbedded arenites and conglomerates; the Firstbrook Member, by definition, does not. Overlying the Gowganda Formation is a thin veneer of coarse-grained feldspathic arenite with thin beds and pods of pebble conglomerate. Graded beds, crossbeds, and the pebble horizons indicate that the Lorrain Formation was deposited in a fluvial environment.

Mafic Intrusive Rocks

Nipissing Diabase

In the map area, the Nipissing Diabase forms three major sill like bodies and a few narrow dikes. A west-dipping sill is found in the western part of Tudhope Township; a south-dipping sill occurs in southwestern Bryce Township, and an east-dipping sill is found in southern Dack Township and may be part of a large geophysically interpreted sill in Beauchamp Township. Except for thin chill margins and aplite dikes, the diabase has a monotonous appearance throughout the map area. Aplite, a late granophyric differentiate of the diabase, is only found as dikes within the sill that occurs in western Tudhope Township and eastern James Township.

The diabase is a dark greenish grey, massive equigranular, fine- to medium-grained, diabasic to ophitic textured rock. The weathered surface is dark green to grey. The sill in Dack Township contains coarse-grained schlieren, as well as angular xenoliths of fine-grained diabasic material. Mineral layering was observed in a fine-grained part of the sill in Dack Township. This layering has an azimuthal trend of 150° which is approximately parallel to the Lake Timiskaming West Shore Fault which bounds the sill on the west. In thin section, the diabases are revealed, for the most part, to be highly altered; the pyroxenes are completely altered to chlorite and biotite and the plagioclases are altered to sericite and epidote. Minor interstitial granophyric intergrowths of quartz and feldspar occur between the altered grains. Magnetite and leucoxene form small euhedral and box work-textured crystals.

Aplite occurs in thin, fine-grained dikes or veins and is restricted to the sill outcropping in western Tudhope Township. The gold, cobalt, and copper mineralization in the Elk Lake area appears to be associated with these late differentiates. These aplite intrusions range in width from 6 to 35 cm and from pink to pinkish grey. The aplite is composed of albitic plagioclase and quartz in micropegmatitic intergrowths.

PHANEROZOIC

CENOZOIC

Quaternary

Pleistocene and Recent

The Quaternary geology of the Hill Lake area can be subdivided into two regions: regions in which the bedrock controls surficial expression and regions in which Quaternary deposits affect surficial expressions. The Quaternary geology of Dack and Beauchamp Townships has been mapped by King and Morton (1979) and Morton *et al.* (1979), and the entire area is covered by the map produced by Boissonneau (1965).

The outcrop area in Tudhope, Truax, and Bryce Townships is overlain by a thin discontinous veneer of ground moraine consisting of silty to sandy till and a mixture of lacustrine deposits composed of fine-grained sand and varved or massive silt and clay. Most of the non-outcrop area is covered by varved clay of the Little Clay Belt. Superimposed on the varved clay is an interlobate moraine with associated fine sand and gravel outwash deposits.

The interlobate moraine, a major glacial feature, has been mapped in detail by Morton *et al.* (1979) and is described as follows:

> "Hill Lake Moraine: This major glacial feature in the northwestern corner of the map area dominates the surrounding terrain and forms a series of kame-like deposits positioned along the line of the Cross Lake Fault Escarpment. The complex is interpreted as being a series of marginal, lateral, and interlobate moraines developed as the fronts of the contiguous Hudson Bay and Laurentide ice sheets retreated to the north and northeast, respectively. The moraines cover, in part, the prominent Hammond Lake and Kenabeek Esker systems and are associated with an apparent spillway system which discharged southward along the line of the Cross Lake Fault Escarpment while ice was still present in the Timiskaming Valley. The core of the moraine exhibits many excellent examples of ice block depressions (kettle holes), crevasse infillings, ice frontal ridges and push moraines, and grades peripherally into outwash, beach, and lacustrine conditions on the southern, southeastern, and southwestern sides.
>
> The Kenabeek Esker System which disappears beneath the southwestern margin of the moraine, indicates a northeastward retreat of the ice front from the Montreal River Valley to the Cross Lake Fault Escarpment. This contrasts strongly to the north-south orientation of the Hammond Lake and Armstrong Esker which lie on the line or to the east of the Cross Lake Fault Escarpment".

Another area of complex glacial geology was mapped by Morton *et al.* (1979) along the eastern boundary of Beauchamp Township and is described as follows:

> "Armstrong-Beauchamp Township Boundary Complex: This glaciofluvial feature which protrudes at intervals through a thick mantle of terraced glaciolacustrine varved clays and silts along the line of Armstrong and Beauchamp Townships boundary, appears to be of possibly mixed origin constituting a series of kame nodes strung along a large buried esker. The southern end of the feature is the rock-till complex which forms the prominent hill some 2 km west of Earlton Airport. Kame nodes protrude above the varved clay terrace level in concessions V and VI of Armstrong Township, where the sands and gravels have been worked as a granular resource. Current bedded sands with a trace of fine gravel outcrop in the floor of the intervening valley where they can be seen to pass upward conformably into thick varved sands, varved silts and varved silts, and clays. Depositional features exposed in several of the gravel pits suggest lateral ice margin conditions with the possibility of minor ice thrusting. The bulk of the feature comprises clean esker sands and gravels, however, with abrupt upward and marginal transgression into glaciolacustrine clay-silt rhythmites or contorted till-like mantle".

Recent deposits consist primarily of unsubdivided alluvium in the stream and river valleys and in peat and bog deposits.

Structural Geology

The Hill Lake area is located on the southern limb of the Round Lake Anticline whose core is occupied by the Round Lake Batholith. The structural geology of the area is relatively simple. Basement diapirism in the Early Precambrian resulted in mild deformation having a nonpenetrative fabric. Extensional tectonics beginning in the Middle Precambrian resulted in the regional northwest-trending faults forming the Lake Timiskaming Rift Valley. These faults have been active into recent times (Lovell and Caine 1970).

The metavolcanics strike in a northeast direction and are subparallel to the contact with the Round Lake Batholith. These rocks face southeast. The dips of the rocks in Bryce, Tudhope, and Robillard Townships are vertical to near vertical. In southern Dack and northern Beauchamp Townships the metavolcanics are overturned and have dips ranging from 70° to vertical. The overturning of the stratigraphy may be the result of the metavolcanics being pulled towards the rocks of the Round Lake Batholith as it was intruded into the overlying volcanic rocks (L.S. Jensen, Geologist, Ontario Geological Survey, verbal communication, 1982). The low metamorphic grade of the metavolcanics may attest to the fact that the rocks were pulled down from above and not thrust up from below.

The intrusion of the Round Lake Batholith has had a regional effect on the rocks within the map area. The tonalites of the Round Lake Batholith itself are foliated in an east-west direction except near the contact with the metavolcanics where the foliation is subparallel to the contact. The contact with the foliated tonalite and the metavolcanics in the western part of the area is intrusive in nature and the event has not produced a penetrative foliation in the metavolcanics. In Dack Township, the contact of the Round Lake Batholith is, in part, faulted, and the effect on the metavolcanics has been pronounced. The rocks are highly schistose, becoming more convolute as the contact is approached. The actual contact in northeastern Dack Township is a fault, and in the vicinity of the fault, the rocks of the Round Lake Batholith are cataclastic in nature. This cataclasis grades into normal foliation over 800 m.

In southern Bryce and Tudhope Townships, the metavolcanics have a strong northwest-trending schistosity. This schistosity has overprinted and almost completely obliterated the bedding. The northwest-trending schistosity and alteration may be due to the intrusion of an unexposed porphyry body similar to the Britcanna Porphyry. The Britcanna Porphyry is foliated in a northeast and a younger northwest direction giving the outcrops a hackly appearance.

The sedimentary rocks of the Cobalt Group have dips ranging from 10 to 25°. These are primary dips and reflect the underlying Early Precambrian topography. Dips up to 90° were observed where the Gowganda Formation conglomerate was plastered directly on the vertical side of an Early Precambrian outcrop. Generally, the sediments rest directly on the underlying metavolcanics, but in two locations this contact has been faulted along a shallow-dipping carbonate filled fault.

FAULTS AND LINEAMENTS

There are at least two ages of faults and lineaments within the map area. Early Precambrian faulting in Tudhope, Bryce, and Robillard Townships may be the result of the intrusion of the Hope Lake Stock which produced major east-northeast and north-northeast trending pyritiferous shear zones and faults like the "Palmer-Vaughan-Estival Break" which can be traced northeasterly to the Cross Lake Fault. The compressive force caused by the intrusion of this later phase of the Round Lake Batholith may account for these faults. Northeast-trending faults and shear zones in Dack Township are predominant in the less competent ultramafic horizons and may be the result of the intrusion of the Round Lake Batholith.

Lineaments and faults in the Round Lake Batholith itself have north to north-northeast trends. The majority of the lineaments may be the result of joint patterns due to the cooling of the batholith, and some of the faults may be the result of further movement of the semicooled tonalitic melt. The strong foliation suggests that the tonalite had a high crystal component when it was emplaced.

The main structural event in the Middle Precambrian was the formation of the Montreal River Fault, Cross Lake Fault, Lake Timiskaming West Shore Fault, and various unnamed northwest- trending faults. These faults are part of the Lake Timiskaming Rift Valley (Lovell and Caine 1970). The regional faults, which are named, are deep and may have tapped the mantle acting as a conduit for the Nipissing Diabase. The outcrop configuration of the diabase in Dack Township suggests this relationship.

Cooling fractures and post cooling movement in the Nipissing Diabase created zones of weakness along which granophyric aplite were intruded. Minor faults with chloritized slickensides crosscut the aplite and many of these cross faults and joints contain bornite, chalcopyrite, specular hematite, and silver-bearing carbonate veins.

Economic Geology

In the map area, prospecting was started in the early Twentieth Century. Cobalt and silver orebodies similar to those found in the Cobalt Mining Camp were sought. Several shafts were sunk on the Nipissing Diabase sill in the western part of Tudhope Township, but no economic deposits were found. Active prospecting for gold commenced in the late 1920s after a forest fire had devastated the area, and prospecting has continued to the present. No economic amounts of massive sulphides have been recorded to date, and the only base-metal mineralization discovered to date is of the vein type.

GOLD

Prospecting and exploration for gold has been active and continues to be active within the map area. Recently, the areas of interest have been in Bryce and Dack Townships. Tudhope Township was heavily prospected in the past, but in 1981 was still withdrawn from staking as a result of the Bear Island Indian land claim.

In Tudhope Township, the area west and northwest of Honeymoon Lake has been examined by many individuals and companies (Moorhouse 1944; Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake; Assessment Files Research Office, Ontario Geological Survey, Toronto). Samples of rusty quartz and rusty shear zones taken from trenches in this area are reported to contain gold the range of 0.11 to 3.02 ounces per ton. The higher assays were from pyrite-rich quartz. In this region, two grab samples were taken by the field party from a 16 m long trench trending N50°E and from a rusty shear zone exposed in a pit. These were assayed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, and contain 0.32 and 0.12 ounce gold per ton, respectively. Ten leased claims south of Honeymoon Lake are owned by Mrs. G. Karp and Mr. R. Karp (Karp Property (20) *see* Map 2501, back pocket). A shaft and five trenches along a N60°W trending carbonatized shear zone were sampled by E.W. Karp, and the reported assays range from 0.20 to 0.66 ounce gold per ton. In 1940, Lake Shore Mines, Limited assayed 40 samples from the shaft and trenches and 12 of the samples had values ranging from 0.01 to 0.90 ounce gold per ton. The samples that contained gold were of rusty or mineralized quartz and carbonatized schists. A grab sample taken from quartz veins in carbonatized pyroclastic rocks taken by the field party from a pit on the Karp Property (20) was assayed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, and contains 0.17 ounce gold per ton.

In Bryce Township, exploration and prospecting continues to be intense. Most of the work to date has been on the Britcanna Porphyry; the northeast-trending shear zones and the highly schistose, carbonatized pyroclastic rocks east and southeast of Heather Lake. The Britcanna Prospect (Moorhouse 1944) contains several gold bearing-zones. Zone Number 1 is within the south-central part of the Britcanna Porphyry and consists of quartz veins and stringers striking N30°W with a strike length of 39 m. Reported assay values range from 0.12 ounce gold per ton over 1.3 feet to 4.97 ounces gold per ton over 3.5 feet and two 5-foot sections assay 0.88 ounce and 1.13 ounces gold per ton (Moorhouse 1944). Zone number 2 is at the contact of the pillowed mafic flows and intermediate pyroclastic breccia and tuff-breccia south of the Britcanna Porphyry. This zone trends N70°E and has been investigated by diamond drilling, and assays of 0.16 to 0.70 ounce gold per ton over 2 to 2.5 feet were reported (Moorhouse 1944). All northeast-trending shear zones are of interest, especially the "Palmer -Vaughan -Estival Break". The main showing of the Briscoe Bryce Deposit (Edward Briscoe (4)) is along a northeast-trending shear zone containing a seam of massive pyrite, disseminated pyrite and chalcopyrite and quartz-carbonate stringers. A considerable amount of trenching, stripping, diamond drilling, and sampling has outlined a zone 450 feet long and 3 to 4 feet wide which averages 0.20 to 0.28 ounce gold per ton (Gordon *et al.* 1979). A grab sample of massive pyrite taken by the field party from the shear zone near the shaft of the old mine was analyzed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, and contains 11 ppm gold. The Gossan Resources Limited Property (Libby Prospect (15)) is within the carbonatized northwesterly-trending shear zones and the quartz-carbonate veins. Assays re-

ported from exploration work done on this property range from 0.09 ounce to 1.91 ounces gold per ton (Moorhouse 1944; Assessment Files Research Office, Ontario Geological Survey, Toronto). Grab samples of quartz and quartz-carbonate veins taken from this property by the field party and assayed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, contained gold ranging in amounts from 0.18 ounce to 0.26 ounce gold per ton. As noted in Tudhope Township, the higher gold values are associated with pyrite-rich quartz veins and shear zones. The gold appears to be related to the smaller feldspar porphyry dikes and sills as well as shear zones.

Although the lack of outcrop in Dack Township precludes the discovery of many gold showings, two prospects have been discovered. The Hillcrest Property (A. Mowat (34)) contains a carbonatized, fuchsite-bearing shear zone (N38-45°E) with a 60 to 90 cm wide quartz vein. About 100 m of trenching has exposed the vein and sampling has indicated values of 0.20 ounce gold per ton over 2.8 feet for a strike length of 200 feet (Moorhouse 1944). Diamond drilling carried out in 1939 to 1941 has indicated values of gold ranging from 0.02 to 0.24 ounce gold per ton over 5 feet for a strike length of 225 feet (Moorhouse 1944). A grab sample taken from the fuchsite-bearing carbonatized shear zone by the field party and assayed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, contains 0.02 ounce gold per ton. The second gold showing in Dack Township, the Weeks-Simkin Property (55), consists of a 1.2 m wide highly fractured, quartz-rich zone which contains minor molybdenite. The quartz is in highly sheared, carbonatized mafic and ultramafic metavolcanics. Diamond drilling results were generally poor, the highest assay being reported at 0.46 ounce gold per ton. The field party sampled a carbonatized, fuchsite-bearing schist found along the Englehart River north of Charlton which, when assayed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, was found to contain 0.09 ounce gold per ton.

Gold mineralization appears to be associated primarily with carbonatized sheared rocks; the higher gold values being associated with pyrite mineralization. The source of the fluids carrying the gold may be the large altered feldspar porphyry bodies that are genetically related to the Skead Group. The shear zones, which either predate or are syntectonic with the intrusion of the porphyry bodies, acted as conduits for the movement of the mineralizing fluids. The "Palmer -Vaughan -Estival Break" in Tudhope and Bryce Townships intersects the top of the Britcanna Porphyry, and thus can readily tap this source of fluids. The northeast-trending shear zone at the Briscoe-Bryce Deposit (Edward Briscoe (4)) is largely buried under Quaternary clay, but may extend to the Britcanna Porphyry and may have tapped the fluids from the Britcanna Porphyry as well. The strong shearing and carbonatization of the metavolcanics in the vicinity of Heather Lake in Bryce Township might be the intense alteration that surrounds a concealed large porphyry body similar to the Britcanna Porphyry. Numerous feldspar porphyry and quartz-feldspar porphyry bodies and dikes exist in this area as well. This hidden intrusion may be the source for the gold in the parts of southern Bryce and Tudhope Townships.

SILVER

Silver occurs within the map area and is related to the Nipissing Diabase sill that outcrops in western Tudhope Township. Much of the exploration that has occurred since the report by Moorhouse (1944) consists of the dewatering of old shafts and pits and the examination of trenches (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake).

The silver occurrences within the area are found in carbonate veins associated with the thin aplite dikes found within the Nipissing Diabase sill. Currently (1980), Northern Silver Fox Resources Incorporated is driving an adit easterly towards the shaft of the former Silver Jackpot Mine (Northern Silver Fox Resources Incorporated (36)) along an aplite vein and associated carbonate veins. Silver values as high as 1079 ounces silver per ton have been reported from samples taken from the shaft which was sunk at the intersection of two aplite carbonate vein systems (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Devel-

opment and Mines, Kirkland Lake). A new vein system was exposed and trenching was undertaken 800 m east of the shaft. Several anastomosing vein systems trend in a northeasterly direction. A composite sample across the vein system was taken by the field party and was assayed by the Geoscience Laboratories, Ontario Geological Survey, Toronto and contains 1.04 ounces silver per ton.

BASE METALS

Bornite, chalcopyrite, and specular hematite occur in carbonate veins within the Nipissing Diabase in western Tudhope Township. The veins, with few exceptions, are associated with aplite dikes and veins. Two grab samples taken by the field party from veins near the shaft of the Silver Jackpot Deposit (Northern Silver Fox Resources Incorporated (36)) were analyzed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, and contain 1.2 and 2.58 percent copper. Two samples taken from the trenches 800 m east of the shaft contain 1.23 and 3.59 percent copper. The Ethel Copper Mine adjacent to Tudhope Township in northeastern James Township reported analyses of 3.15 percent copper over 6.3 feet (Mackean 1968).

Chalcopyrite was observed in Gowganda Formation conglomerate next to the unconformity with mafic metavolcanics in central Tudhope Township. A 30 element spectrographic analysis was carried out on a grab sample of the mineralized conglomerate which indicated a copper content between 0.05 and 0.50 percent.

Chalcopyrite is ubiquitous within the shear zones found within the metavolcanics in Bryce and Tudhope Townships, and is commonly found associated with quartz mineralization. A sample taken by the field party from a pit on a southeast-trending shear zone west-northwest of Honeymoon Lake was analyzed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, and contains 1.33 percent copper. Many grab samples taken from rusty shear zones by the field party were submitted for 30 element spectrographic analyses and were found to contain at least traces of copper and zinc.

URANIUM

The Sauvé Prospect (George Welsh Property (46)) in the NW1/4, N1/2 of lot 10, concession VI, Tudhope Township contains small amounts of pitchblende in a carbonate vein along the contact of a Nipissing Diabase dike and Gowganda Formation conglomerate. A selected sample of radioactive material contains 1.56 percent U_3O_8 equivalent (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake).

DESCRIPTION OF PROPERTIES

The descriptions of properties in good standing on December 31, 1980 are listed by the full name of the company or person who held the property. Descriptions of properties no longer in good standing, are listed by a name derived from the company or party who carried out the exploration work. An unclaimed parcel of explored land in which no mineral showings were located is listed by the full name of the company or person who held the land and by the date in brackets of the last major work.

The information is based on files in the Assessment Files Research Office, Ontario Geological Survey, Toronto, and Resident Geologist's Files, Ontario Ministry of Northern Development and Mines, Kirkland Lake.

CHARLES BAILEY PROPERTY (1)

Charles Bailey owns the patented claims (T 24443, T 24444) in the SE 1/4, SW 1/4, N 1/2 of lot 6, concession IV, Bryce Township. The claims are found on the southeastern margin of the Britcanna Porphyry and are underlain by interbedded mafic pillowed flows and intermediate tuff and lapilli-tuff and Gowganda Formation clast-supported conglomerate. There is no record of assessment work having been done on these claims.

W.J. BAILEY PROPERTY (2)

W.J. Bailey owns five patented claims and one unpatented claim in two groups in Bryce Township. The northern group consists of three patented claims (T 23619 and T 23620; T 23625) in the NW 1/4, SW 1/4, SE 1/4, S 1/2 of lot 12, concession V, Bryce Township. The group is underlain by massive and pillowed mafic metavolcanic flows. These claims and the western four patented claims of Edward Briscoe have been explored by the Krone Mining Syndicate, Limited, and that work has been described by Moorhouse (1944):

> "The Krone Mining Syndicate, Limited, controls 11 claims in two blocks in Bryce Township. No. 1 group comprises claims T. 23,619, 23,620, and 23,625 (northwest, southeast, and southwest quarters of the south half of lot 12, concession V); 23,724 and 23,726 (northeast and southeast quarters of the north half of lot 12, concession IV); and 23,723 and 23,725 (northwest and southwest quarters of the north half of lot 11, concession IV). The No. 2 group comprises claims T. 23,618 (southeast quarter of the south half of lot 11, concession IV), 23,735 (southwest quarter of the south half of lot 10, concession IV), 23,855 and 23,736 (northwest and northeast quarters of the north half of lot 10, concession III). The most important discoveries so far made are on the northern or No. 1 group of claims.
>
> The syndicate was incorporated on December 22, 1937, to take over claims held by J.R. Bailey, W. Bailey, W. McDougall, and C.B. Stevenson.
>
> The northern or No. 1 group of claims is underlain by pillow lavas and intermediate and acid volcanics (breccias, tuffs, and flows). The southern or No. 2 group is underlain by light-weathering volcanics. The formations strike north of east and show remarkably little shearing except along local zones. A few porphyry and lamprophyre dikes are exposed, though they are usually of narrow width.
>
> Most of the work has been done in a zone of mineralization that apparently follows a body of much carbonatized, sericitized banded tuff (?) and chlorite schist, at the contact of pillow lavas on the north and younger agglomerates on the south. The mineralization is entirely hidden by drift and has been explored by deep pits and trenches now filled with water. It consists entirely of cube pyrite, which occurs in some abundance. A narrow seam of rusty material is said to pan gold. About five drill-holes were put down on this showing. Results were not encouraging, although high sludge assays are reported. According to J.R.Bailey, the best assay obtained from drill-cores of the pyritized rock was 0.05 ounces in gold per ton. To the north some trenching was done on the extension of the Palmer-Vaughan break on claim T. 23,620. Some values are reported.
>
> In the southern or No. 2 group, a considerable amount of trenching had been done on sheared zones along the south side of a hill of agglomerate, which at one point has exposed for 70 feet a narrow branching shear zone; each of the two branches carries seams of massive sulphide, pyrite, and chalcopyrite, which are much rusted. The zones reach a maximum width of 2 feet but rapidly narrow both east and west to a few inches. The strike is N. 60°-70°E. Interesting values are reported. In addition, a mineralized zone associated with a porphyry dike trending a few degrees west of north is said to have carried values. A diamond-drill hole was put down on this showing, which was not seen by the writer."

The southern group consists of two patented claims (T 23618; T 23735) as well as one unpatented claim (L 562271). The two patented claims are the SE 1/4, S 1/2 of lot 11, concession IV, and the SW 1/4, S 1/2 of lot 10, concession IV. The unpatented claim is on the NE 1/4, S 1/2 of lot 11, concession IV. The claims are underlain by the quartz-feldspar porphyry subvolcanic sill, tuff, lapilli-tuff, and pyroclastic breccia. The patented claims were explored by the Krone Mining Syndicate, Limited. The unpatented claim has had a 260-foot long diamond-drill hole sunk on it in 1970 by E. Briscoe (Assessment Files Research Office, Ontario Geological Survey, Toronto).

J. BECKER PROPERTY (3)

J. Becker currently owns five unpatented claims (L 550511 to L 550515) in the N 1/2 of lot 8, concession II and the SW 1/4, N 1/2 of lot 7, concession II, Robillard Township. These claims are underlain by massive amphibolite and amphibolitic pillowed lavas that are intimately intermixed with contaminated tonalite and diorite. Dikes of uncontaminated trondhjemite crosscut the mafic metavolcanics as well as the diorite.

The claims were formerly owned by the Long Lake Gold Mining Syndicate, and Moorhouse (1944) described this property:

> "The Long Lake Gold Mining Syndicate, locally known as Hobo Mines, controls a group of 11 patented claims on and south of Robillard lake in the central part of Robillard township. The claims are T. 24,081, 24,046, 12,096, 12,094, 288, 2,093, 304, 1,383, 12,095, and 12,152 (northeast and southeast quarters of the south half of lot 9, concession III; southwest quarter of the south half of lot 8, concession III; north half of lot 8, concession II; southwest and southeast quarters of the north half of lot 7, concession II; and northeast and southwest quarters of the south half of lot 7, concession II). The claims are underlain by platy hornblende schists cut by granites and hybrid diorites. Shafts, a 35-foot tunnel, and some trenches were opened at various points along the cliff facing the Elk Lake road and in the outcrops to the south. Not all the workings were seen by the writer, but apparently the work was done on narrow quartz veins with a maximum width of 2 feet, accompanied by pyrite in the adjoining walls of recrystallized greenstone. The work said to have been done by Elijah Decou, of Port Dover. Assays are reported to have yielded only traces."

EDWARD BRISCOE (BRISCOE-BRYCE DEPOSIT) (4)

Edward Briscoe owns ten patented claims (T 25691 to T 25697; T 24227 to T 24229) in the N 1/2 of lot 10, concession IV; N 1/2 of lot 11, concession IV, and the NE 1/4, SE 1/4, N 1/2 of lot 12, concession IV, Bryce Township. Three of the claims (T 24227 to T 24229) are the site of the Briscoe-Bryce Deposit which has been described in detail by Moorhouse (1944):

> "Briscoe-Bryce Mines, Limited, controls three claims in Bryce Township, T. 24,227 to 24,229 (southwest quarter of the north half of lot 10, southeast quarter of the north half of lot 11, and southeast quarter of the north half of lot 10, concession IV). The property was staked by the Briscoe brothers of New Liskeard, and, prior to 1938, a little diamond-drilling was done on it under option agreements. In 1938 an option was taken by H.F. Strong for Halcrow Swayze Mines, Limited, and an aggressive campaign of trenching in the heavy drift was instituted under his direction. In November, 1938, the property was incorporated under the name of Briscoe-Bryce Mines, Limited. In February and March 1939, Mining Projects of Canada, Limited, sampled and drilled the property, performing in all 1,500 feet of drilling, which indicated the persistence of the vein structure at depth and along the strike to the east.
>
> The eastern part of the property is buried under heavy drift. The rocks outcropping elsewhere are chiefly massive, undeformed, coarse agglomerate and beds of tuff. Mineralization is found in a heavy shear zone in intermediate volcanics and in irregular fractures and shear zones in the adjoining rocks. The main shear zone is heavily carbonatized and sericitized, so that the original nature of the country rock is a matter of conjecture.
>
> The main zone of mineralization is exposed at the present time only in the long western trench. Here the zone has a maximum width of 5 1/2 feet. The principal mineralization is a seam of massive, rather white crystalline pyrite with a maximum width of 3 inches associated with varying amounts of glassy clear quartz. Some disseminated pyrite is also present, and chalcopyrite was noted in the quartz.
>
> Carbonate is present in abundance in the sheared zone and as fibrous fillings in joints. Native gold is said to have been found in this and in some of the trenches to the east, but none was observed by the writer.

Some 70 feet north of the main zone a trench on the side of an outcrop of agglomerate has exposed a number of narrow, branching, irregular stringers, which have a maximum width of 7 inches, strike N. 60°-67°E., and dip south. These stringers are filled with quartz and carbonate and mineralized with chalcopyrite and pyrite. A greenish mica (chromium-bearing?) is associated with the disseminated, locally massive pyrite. There is considerable evidence of leaching and oxidation in this trench. Similar stringers are exposed in trenches to the east.

The main zone has been followed by pits and trenches at intervals for a length of about 550 feet, and values are reported to have been obtained from it in most of the openings. More than 2,000 feet of diamond-drilling has been done on the property. Most of the drilling was carried out by Noranda and, as already noted, by Mining Projects of Canada. The property besides being examined by these groups was sampled by the Consolidated Mining and Smelting Company and Sylvanite. Channel samples taken by these companies ranged from traces to 26.8 pennyweights in gold over widths of from 1 to 5 feet. This sampling is reported to have indicated two zones: one 72 feet long in the main west trench, averaging more than 3 pennyweights over a width of 1 1/2 feet; and a second 150 feet long near the east end, averaging 6 to 7 pennyweights over 2 1/2 feet. H.F. Strong states that after trenching had exposed the mineralized zone in some 15 pits and trenches his sampling indicated an ore shoot 450 feet long and 3 to 4 feet wide, averaging 0.20 to 0.28 ounces of gold per ton. The values obtained from diamond-drilling were, with two exceptions, disappointing, but the shear zone was found to extend for a further 185 feet to the east. Mr. Strong states that the core was not recovered in one section in which ore might have been expected. Grab samples were taken by the author and assayed at the Provincial Assay Office. Massive pyrite from the main west trench gave 0.22 ounces in gold; leached rusty siliceous material carrying chalcopyrite from the north trench gave 0.23 ounces; and a specimen of finely disseminated pyrite in weathered siliceous sericitic gangue from the latter gave 0.03 ounces.

The results so far obtained are interesting, although widths are rather narrow. Further exploration will be difficult because of the heavy overburden east and south of the break and along its strike."

The main gold showing on claim T 24227 (SW 1/4, N1/2 of lot 10, concession IV) has been the subject of much exploration work by both the Briscoe brothers and other parties who have optioned the property. In 1954, Halliwell Gold Mines Limited optioned the claims and did some diamond drilling. Diamond drilling and trenching were also carried out by the Briscoe brothers in 1955 and 1957. A 2.5 ton Gibson mill was set up on the property in late 1958 and, in 1959, an 80-foot deep 40° decline was sunk at the western end of the main showing. In 1961, a 60 to 75 ton per day gold mill was set up on the property and a head frame was erected over the inclined shaft in 1962. Additional diamond drilling was carried out in 1964 (Assessment Files Research Office, Ontario Geological Survey, Toronto).

The Trihope Mining and Exploration Limited completed detailed electromagnetic, magnetic, and geological surveys over a large group of claims which included the Briscoe brothers' claims (Assessment Files Research Office, Ontario Geological Survey, Toronto). In 1973, Northville Exploration Limited optioned the property and staked more claims to the south, but no further work was done on the property (Assessment Files Research Office, Ontario Geological Survey, Toronto). The Rip Van Winkel Syndicate staked 17 claims in Bryce and Tudhope Townships and optioned the 10 Briscoe brothers' claims. In 1975, five diamond-drill holes were put down for a length of 737.7 feet by the Rip Van Winkel Syndicate to intersect the main mineralization. Assay results on the core were discouraging.

A sample of massive pyrite was taken by the field party from the shear zone in the trench just northeast of the head frame and was analyzed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, and was found to contain 11 ppm gold. A great deal of diamond drilling has been completed to test the main showing and gold values have been sporadic. This may be due to the poor core recovery

reported from the "ore zone" (Assessment Files Research Office, Ontario Geological Survey, Toronto). This zone is reported to contain 50 percent vugs and open seams, 25 percent rusty vuggy quartz containing much pyrite, and 25 percent altered tuffaceous material. One reported assay from this zone was 0.51 ounce gold per ton (Assessment Files Research Office, Ontario Geological Survey, Toronto).

West of the main showing, north of Honeymoon Lake, along the contact between the mafic and intermediate metavolcanics, a pyritiferous tuff horizon has been trenched and investigated by diamond drilling by the Rip Van Winkel Syndicate (Assessment Files Research Office, Ontario Geological Survey, Toronto). This contact was also prospected by the Krone Mining Syndicate Limited in 1937 (Moorhouse 1944). A channel sample taken along a 100-foot long trench was reported by the Syndicate to have an assay value of 0.114 ounce gold per ton across 60 feet (Assessment Files Research Office, Ontario Geological Survey, Toronto). The Rip Van Winkel Syndicate put down two diamond-drill holes for a total length of 328 feet in 1975 on the patented claim T 25697, but the results of the assays were not conclusive.

H.J. BRISCOE PROPERTY (5)

H.J. Briscoe currently owns six unpatented claims (L 578257; L 578261; L 578263 to L 578266) in the S 1/2 of lot 12, concession IV, and the NW 1/4, SW 1/4, S 1/2 of lot 11, concession IV, Bryce Township. These claims are underlain by intermediate to felsic carbonatized tuff, lapilli-tuff, tuff-breccia, and pyroclastic breccia which has been intruded by a hypabyssal sill of quartz-feldspar porphyry.

A part of this claim group was examined by the Bryce Gold Mines Syndicate (Moorhouse 1944). Trihope Mining and Exploration Limited, as part of a larger survey, carried out magnetic, electromagnetic, and geological surveys over the ground (Assessment Files Research Office, Ontario Geological Survey, Toronto). In 1975, the Rip Van Winkel Syndicate owned the ground and completed a follow up magnetic and electromagnetic survey.

P.A.R. BROWN PROPERTY (6)

P.A.R. Brown currently owns seven unpatented claims (L 507606 to L 507612) in the S 1/2 of lot 11, concession V, and the NW 1/4, NE 1/4, SE 1/4, S 1/2 of lot 10, concession V, Bryce Township. The ground is underlain by massive and pillowed mafic metavolcanics which have been intruded by feldspar porphyry dikes and sills. A strong northeast-trending lineament crosses the property.

This ground was originally part of the southern group of the Town -Woolings -Mulholland claims as described by Moorhouse (1944). In 1967, Trihope Mining and Exploration Limited completed magnetic, electromagnetic, and geological surveys over the western part of these claims. In 1972, Consolidated Boeing Holdings and Resource Limited carried out electromagnetic check surveys on the western part of the claim group (Assessment Files Research Office, Ontario Geological Survey, Toronto).

CHARLTON GROUP PROPERTIES (7)

The Charlton Group consists of six patented lots in the vicinity of the town of Charlton in Dack Township. There is extensive overburden in the area and the majority of the outcrop exposures are restricted to the Englehart River. The lots are underlain by highly metamorphosed, interbedded ultramafic and mafic flows which have been intruded by aplitic dikes. The ultramafic flows are schistose and have been highly altered to chlorite and carbonate. In the town of Charlton, there is an ultramafic layered intrusion with a Wehrlite base and a leucocratic gabbro-norite top. Fuchsite-carbonate schists are found within the ultramafic flows. Moorhouse (1944) has described the work carried out on the various parts of the Charlton Group as follows:

> "The Charlton group in Dack Township consists of 6 lots belonging to the following: H.S. Malkin, of Charlton (the Ryan lots, north half of lot 11, conces-

sion IV, and south half of lot 10, concession V); Harry Grant, of Charlton (north half of lot 11, concession V); J. Deveny, of Charlton (north half of lot 10, concession V); Tom Regan, of Charlton (north half of lot 9, concession V); and Wesley McKnight, of New Liskeard (south half of lot 11, concession V).

The claims are underlain by a very complicated series of rocks, including coarse gabbros and altered peridotites at the Charlton power-house and a complex of carbonatized schist, porphyry, carbonate porphyry, lamprophyric rocks, and massive greenstones. The rock is covered by heavy drift except along the Englehart river and the creeks tributary to it and on the Grant lot.

In the north half of lot 11, concession IV (Ryan), a pit was sunk many years ago on a carbonatized sheared zone cut by quartz stringers and heavily mineralized with coarse cube pyrite. A rough 3-foot channel sample of well-mineralized material, submitted by the author to the Provincial Assay Office, gave only 0.01 ounces of gold. The shear zone appears to continue to the east but has not been opened up by trenching.

East, northeast, and north of the power-house trenching was done on carbonate schist and porphyry. Little mineralization was in evidence. An old tunnel was opened in the soft schist many years ago by the late Magloire Deroche.

In the McKnight lot and the second Ryan lot, trenching was done on altered porphyry dikes and on heavily carbonatized zones associated with abundant chrome mica and in some cases cut by white quartz veins. Widths of quartz as much as 2 feet were noted, but no continuity of the veins for any distance was indicated.

On the Regan claim stripping was done on lamprophyres, carbonatized "porphyry", and associated quartz veins cutting heavily sheared hornblende schists. A large blow-out of quartz 9 feet wide and a little more than 20 feet long was also exposed. On the Grant farm a porphyry dike in injected pyritized schist was opened by a single trench. Values obtained in the group as a whole were not encouraging, but the abundant evidences of carbonatization, alteration, and shearing suggest that further prospecting might be worth while. The work on these claims was done for the owners by Otto Kant, of Wawbewawa."

A grab sample of carbonate-fuchsite schist found within an ultramafic chlorite schist was sampled by the field party from the northeast-trending island in the Englehart River north of Charlton. It was assayed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, and contains 0.09 ounce gold per ton.

COPPER ISLAND MINING COMPANY (8)

The Copper Island Mining Company formerly held seven claims in the NE 1/4, S 1/2 of lot 11, concession II; the SW 1/4, NW 1/4, N 1/2 lot 10, concession III, and the SW 1/4, NW 1/4, S 1/2 lot 10, concession IV, Tudhope Township. This property is underlain by massive, pink, medium-grained granodiorite of the Hope Lake Stock. The granodiorite has been intruded by fine- to medium-grained Early Precambrian and Middle Precambrian diabase dikes.

Assessment work on file in the Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake, indicate that four diamond-drill holes were drilled for a total of 160 feet. No date is available for when this work was completed and the claims are no longer in good standing.

DES ORMEAUX-MISKIMINS-CHALUT GROUP (9)

The Des Ormeaux-Miskimins-Chalut Group was a group of 10 claims staked in 1939. The claims were in the S 1/2 of lot 2, concession IV; S 1/2 of lot 3, concession IV, and in the SW 1/4, SE 1/4 of the N 1/2 of lot 3, concession IV, Tudhope Township. The description of this claim group is given by Moorhouse (1944, p.29):

"The Des Ormeaux-Miskimins-Chalut group comprises 10 claims, M.R.12,362 to 12,365 and 12,376 to 12,381 in concession IV of Tudhope Township (southwest and southeast quarters of the north half of lot 3 and the south

halves of lots 2 and 3), which are held by Paul Des Ormeaux, Stuart Miskimins, and A. Chalut, of Elk Lake. Excellent outcrops of basic volcanics, including pillow lavas, are exposed on the claims. These rocks are cut by various feldspar porphyries, carbonatized porphyries, and related rocks.

On claim M.R. 12,364, in the southwest quarter of the south half of lot 2, a quartz porphyry dike strikes N20°W and is cut by a quartz vein, which is about 6 inches wide and 120 feet long and strikes N10°W. Sampling by D.K. Burke, of Sylvanite Mines, is said to have given a moderate content of gold over narrow widths. On claim M.R. 12,377 (northeast quarter of the south half of lot 3), at least 500 feet of stripping has been done on a carbonate porphyry dike, which is 12 to 15 feet wide and strikes N35°E. It is cut by a milky fractured quartz vein, which has a maximum width of 2 feet and is mineralized with a little pyrite and chlorite. A claim north of this, a short stringer, which carries chalcopyrite and has a maximum width of 10 inches, is exposed on the strike of a dark quartz-feldspar porphyry dike. Other workings in this general area were not visited."

The Assessment Files in the Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake, contains a one page report by D.K. Burke of the Sylvanite Gold Mines Limited. He examined the main showing of the Des Ormeaux -Miskimins Chalut Group in the SW 1/4 of the S 1/2 of lot 2, concession IV, and reported an average gold value of 0.29 ounce per ton (5.75 dwt) over 0.52 feet for a strike length of 92.2 feet.

WILLIAM EPLETT PROPERTY (10)

William Eplett currently owns four leased claims (MR 29961 to MR 29964) in the S 1/2 of lot 9, concession I, Tudhope Township. The property is underlain by interbedded, highly schistose and metamorphosed mafic metavolcanics and intermediate to felsic pyroclastic rocks. The schistose metavolcanics contain many porphyritic and felsite dikes, and quartz veins. In 1960, G.S. Eplett prospected the southern part of the property by blasting four trenches and sinking seven diamond-drill holes for a total length of 4649 feet (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). A 2- to 3-foot wide quartz vein can be traced through four trenches in the mafic metavolcanic outcrops just north of Highway 65 east of Wabun Creek. The strike of the vein varies between N60°E and N80°E. The far western trench of the four trenches was reported to contain visible gold in rusty quartz. No assay results have been reported from these showings.

FATIMA MINING COMPANY LIMITED [1962] (11)

The Fatima Mining Company Limited formerly held nine claims north of Honeymoon Lake. Eight of the claims (NE 1/4, SE 1/4, N 1/2 lot 2, concession IV; SW 1/4, NW 1/4, NE 1/4, N 1/2 lot 1, concession IV; SW 1/4, SE 1/4, NE 1/4, S 1/2, lot 1, concession V) are in Tudhope Township and the remaining claim (NW 1/4, N 1/2 lot 12, concession IV) is in Bryce Township. The claims are situated just north of the contact of the Catharine Group and the Skead Group. The claims are underlain by massive and pillowed mafic flows that have been intruded by narrow feldspar porphyry dikes. The property is crossed by a northeast-trending shear zone which shows up as a strong lineament on the air photographs. This is presumed to be the "Palmer -Vaughan -Estival Break"; a major shear zone described by Moorhouse (1944).

An early report on the area was written in 1936, on ground then known as the Milroy Claims (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). Work on this group consisted of trenching two northeast-trending shear zones. Assay results from one of the shear zones range in value from 0.02 ounce to 1.68 ounces gold per ton. The samples with the higher values are all associated with sulphide mineralization. The location of these two shear zones is not known. Moorhouse (1944) reported on a claim group, known as the W.A. Taylor Group, which is located over the same ground as

the Fatima Mining Company Limited claims. The following is his description of the geology and work completed:

> "The W.A. Taylor group comprises eight claims, M.R. 11,436 to 11,440 and 11,444 to 11,446 (north halves of lots 1 and 2, concession IV) in Tudhope township. The group is held by W.A. Taylor, of New Liskeard .
>
> The claims are underlain by coarse- and fine-grained basic lavas and pillow lavas, which have been cut by porphyry and lamprophyre dikes.
>
> Most of the work has been done on a narrow shear zone striking N60°E, which lines up, on aerial photographs, with the Palmer - Vaughan - Estival break. The shear zone cuts medium- to coarse-grained, massive dioritic flows.
>
> It has been traced for at least 1,000 feet along the strike, although interrupted at intervals by considerable stretches of swamp. Quartz and mineralization range in width from 3 inches to a little more than a foot. The quartz, which has a maximum width of 6 inches, is glassy, milky, and green with chlorite or dark in colour. Mineralization, which is apparently chiefly pyrite, is sparse to abundant. In some cases it forms granular vuggy masses as much as 3 inches in width. In cases where the quartz is well fractured, pyrite forms fine-grained fillings in the fractures. White carbonate is later than quartz and pyrite.
>
> A sample of massive pyrite from the vein submitted to the Provincial Assay Office gave 3.02 ounces gold. Mr. Taylor informed the writer that encouraging values were obtained on surface but that diamond-drilling was not successful in obtaining similar results at depth".

The Red Lake Mining Limited acquired a part of these claims, and in 1955 and 1956 put down 23 diamond-drill holes for a total length of 1675 feet (Assessment Files Research Office, Ontario Geological Survey, Toronto). Assay values for gold from vein and gangue material were generally poor and erratic. The best reported result was 1.28 ounces gold per ton over a width of 1.2 feet from vein material containing 60 percent quartz and heavy sulphide concentrations.

The Fatima Mining Company Limited, in conjunction with Mayer Mining Company Limited and Sturdy Mining Limited acquired the ground, and in 1961 old trenches along the "Palmer -Vaughan Estival Break" were being reblasted and sampled. Gold values from quartz stringers with associated pyrite range in value from 0.11 ounce to 1.76 ounces per ton (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). In 1961, Mayer Mining Company Limited put down four diamond-drill holes for a total length of 130 feet across the shear zones and in 1962, Fatima Mining Company Limited put down six diamond-drill holes for a total length of 1696 feet (Assessment Files Research Office, Ontario Geological Survey, Toronto). Samples of drillcore containing quartz were assayed and the results were erratic, ranging in value from 0.02 to 0.43 ounce gold per ton.

G. GEREGHTY (BRITCANNA PROSPECT) (12)

G. Gereghty currently owns 15 claims (L 572512 to L 572526) in the N 1/2 of lot 8, concession IV; N 1/2 of lot 7, concession IV; NE 1/4, SE 1/4, SW 1/4 S 1/2 of lot 7, concession V; NE 1/4, NW 1/4, S 1/2 and SE 1/4, SW 1/4, N 1/2 of lot 6, concession V, Bryce Township. These claims include the ground known as the Britcanna Prospect. Moorhouse (1944) described the Britcanna Prospect and the work completed up to 1940 as follows:

> "The property of Britcana Gold Mines, Limited, comprises 11 claims in Bryce Township, T. 24,001 to 24,003, 24,005 to 24,008, 24,251 to 24,254 (north halves of lots 7 and 8, concession IV; northwest quarter of the north half of lot 6, concession IV; and the southwest quarters of the south half of lots 6 and 7, concession V). Seven of the claims were staked in 1935 by J.J. Flanagan. In the spring of 1936 the group was optioned to M.C. Cowan, and an exploration company was formed. This company carried on a programme of surface exploration and diamond-drilling in 1936 and the early part of 1937. The property was then taken over by Britcana Gold Mines, Limited. It has been idle since that time except for a little work done in 1939.

The northern part of the group of claims is underlain by a medium-grained, much fractured feldspar porphyry. It is quite variable in external appearance, but several thin sections indicate a fairly uniform composition. Phenocrysts of albite and smaller grains of quartz are dotted through a matrix of quartz, feldspar, and chlorite. In sheared specimens the feldspar is much altered.

The porphyry is intrusive into Keewatin volcanics, cutting across the formation so that in the eastern part of the property pillow lavas have been thrust south nearly a mile from the main belt of pillow lavas to the north. To the west the porphyry intrudes agglomerates, tuffs, and related volcanics of intermediate composition.

The porphyry is itself cut by numerous dikes of a lamprophyric character. Especially noteworthy is a "pebble-bearing" dike 20 to 30 feet wide just north of the shaft near the No. 1 ore zone. It is paralleled by a quartz-eye lamprophyre, which cuts the porphyry a few feet to the south. These dikes outcrop a quarter of a mile to the west, and the first also outcrops near the northwest corner of the property. To the east similar rocks are developed in abundance. Whether these represent a single sinuous dike, faulted segments of a straight dike, or separate dikes is not known.

As already noted, the porphyry is extensively jointed and sheared. The jointing is quite irregular and unsystematic with few exceptions. One of these is a rather open set trending northeast-southwest and dipping gently north. It may or may not be filled with quartz or pegmatitic material and occurs in porphyry and volcanics alike. Lamprophyres in porphyry and greenstone strike roughly north-south and east-west. Rather heavy shearing is developed in the porphyry near the main showing parallel to the lamprophyre dikes, and north-south shearing is also important as the locus of mineralization in the No. 1 mineralized zone.

Several mineralized zones have been explored on the property. The No. 1 zone strikes about N. 30°W. and has been exposed by a number of trenches over a length of about 130 feet. The southernmost trench shows the best-looking vein material, which consists of a 1-foot quartz lens associated with about 8 inches of silicification in sheared porphyry. Carbonate and pale-green chlorite (possibly chrome mica) also occur with the sulphides, pyrite and chalcopyrite. The trench is 24 feet long. In the trenches to the north mineralization is not abundant, and there is a considerable quantity of pink carbonate with the quartz. A shaft was begun about 50 feet east of the vein and sunk from 15 to 20 feet. In it the porphyry is cut by extremely irregular jointing occupied by irregular narrow veinlets and splashes of quartz, some of which have coatings of chalcopyrite. A considerable amount of diamond-drilling was done on this zone, and a report for the company by J.C. Houston states that from drill-core assays supplied by J.J. Flanagan and M.C. Cowan of the company one shoot about 250 feet long is indicated. A later report by Mark Little states that an ore shoot 150 feet long is indicated at a depth of 80 feet. According to Mr. Flanagan, values range from 0.12 ounces over 1 foot 8 inches to 4.97 ounces of gold over 3 feet 6 inches, with two sections of 0.88 and 1.13 ounces over 5 feet. A grab sample taken by the writer from surface consisted of quartz and ankerite well mineralized with pyrite and some chalcopyrite and gave 0.88 ounces of gold when analyzed by the Provincial Assay Office. Diamond-drilling failed to pick up values north of the "pebble-bearing dike" just north of the shaft.

The No. 2 mineralized zone is located west of the camp buildings on claim T. 24,253. It is located at the contact of pillow lavas and tuff and has been deeply trenched for 90 feet at N. 71°E. and stripped for a further 75 feet north-east. The only mineralization noticed consisted of splashes of cubic pyrite and quartz and carbonate in the walls of the pit or in the interstices between pillows on the north wall. Chalcopyrite is also reported. Much rusty material is said to have occurred in the pit, and 22 tons of mineralized material shipped to Noranda is reported by Mr. Flanagan to have yielded about 1.2 ounces gold and 22 ounces silver per ton. Shallow diamond-drilling on this

vein was unsuccessful in locating values owing, it is reported, to lost core, but deeper holes are reported by Mr. Little to have given from 0.16 to 0.70 ounces gold over 2 to 2 1/2 feet. One blank was also recorded.

No. 5 zone, which is located in the southwest corner of claim T. 24,003 and strikes, S. 65°E., is exposed in a deep trench and is a 3-inch silicified and rusty shear zone in porphyry. Values up to 0.30 ounces in gold across 18 inches are reported by Mark Little from this trench. A 1-inch quartz stringer containing pyrite was also opened up a short distance to the northeast.

Along the north edge of the greenstone in the northeast corner of claim T.24,006, trenches were opened on narrow stringers of quartz and carbonate containing some chalcopyrite. A rusty leached grab sample of this material yielded 0.02 ounces on assay. About 300 feet to the south, a rather strong shear zone in massive coarse greenstone, trending S. 84°E., has been traced for about 250 feet. At the west end a series of quartz stringers in a zone 3 1/2 feet wide has been exposed. Pyrite, brown-weathering carbonate, and chlorite occur in fractures in the quartz.

Some 300 feet south of No. 2 zone is a series of trenches and pits, having a maximum depth of 10 feet and trending N. 71°E., in sheared agglomerate and other volcanics. The main zone is 2 1/2 feet wide at the west end, and the shearing has resulted in brecciation of the country rock, which was cemented by quartz, coarse pink carbonate, and coarse white carbonate. Fine-grained white carbonate occurs in joint-planes. Mineralization is sparse and includes pyrite and occasional splashes of chalcopyrite in the carbonate. A similar zone, with even less mineralization, is located in the extreme northwest corner of claim T.24,254."

Figure 16 depicts the geology of the Number 1 vein of Moorhouse (1944). The main showing (Figure 17) trending N30°W and the subsidiary shear zones are part of a second stage of deformation. This was noted on an outcrop exposed along the road in the NE 1/4, S 1/2 of lot 7, concession V.

The dump on the Number 1 showing, described by Moorhouse (1944) was sampled by E.E. Campbell in 1963, who reported 1.76 ounces gold per ton and 3.2 ounces silver per ton (Assessment Files Research Office, Ontario Geological Survey, Toronto). Norite Exploration Limited sampled the same dump in 1965 and reported 0.43 ounce gold per ton and 0.08 ounce silver per ton. Five diamond-drill holes (N1 to N5 in Figure 16) were sunk by the company in 1965 for a total length of 1095 feet (Assessment Files Research Office, Ontario Geological Survey, Toronto), but assay results are not available. The Number 2 showing was sampled by E.E. Campbell in 1963 and Norite Exploration Limited in 1965. Two 12 inch samples were taken by each party from the same rusty shear zone in the north wall of the west pit and returned 0.02 and 0.08 ounce gold per ton in 1965 and 0.52 ounce gold per ton and 5.4 ounces silver per ton in 1963 (Assessment Files Research Office Ontario Geological Survey, Toronto). Samples taken by Norite Exploration Limited and E.E. Campbell from a patch of massive pyrite in the south wall returned 1.19 ounces gold per ton in 1965 and 3.6 ounces gold per ton and 5.4 ounces silver per ton in 1963.

A VLF electromagnetic survey and a magnetic survey were carried out in 1968 for E.E. Campbell over the Number 1 and Number 2 vein. The two known showings did not show up on this geophysical survey.

In 1972, Consolidated Imperial Minerals Limited acquired 20 claims which include the Britcanna Prospect. A preliminary VLF electromagnetic survey was carried out in 1972 and veins Number 1 and 2 were sampled. The values were reported to be generally low with a peak value of 0.24 ounce gold per ton over 3.5 feet found in vein Number 1 and in vein Number 2, the values were around 0.02 ounce gold per ton (Assessment Files Research Office, Ontario Geological Survey, Toronto). In 1973, a magnetometer survey was carried out. In 1974, the company sunk six diamond-drill holes for a total length of 1212 feet (74-1, 74-3, 4, 5 on Figure 16). Five of these holes tested the Number 1 vein and the results were

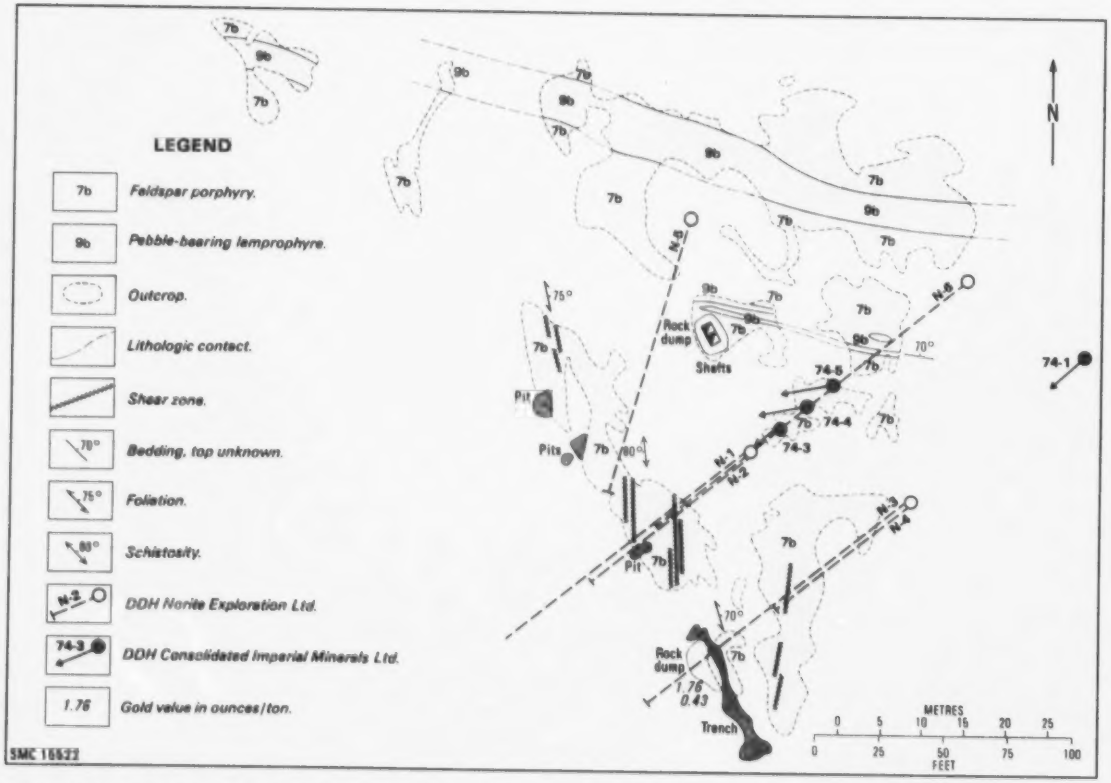

Figure 16. *Geology of the No. 1 vein on the Britcanna Prospect (see G. Gereghty (Britcanna Prospect) (12), and the property listings given on Map 2501, in back pocket). Map modified from information found in the Assessment Files Research Office, Ontario Geological Survey, Toronto.*

disappointing. One diamond-drill hole tested vein Number 2 with similar poor results.

G. GILES (13)

Mrs. Gordon Giles formerly owned the patented lot consisting of the S 1/2 of lot 11, concession IV, Tudhope Township. This patent has been cancelled. The property is underlain by Nipissing Diabase on the west, granodiorite of the Hope Lake Stock on the east, and an intervening finger of Gowganda Formation sediments.

The assessment files in the Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake, contain an updated description of the property. The property is reported to contain from 15 to 20 calcite veins ranging from 1 to 8 inches in width with some of them traceable from 50 to 100 feet. Native silver has been found in two veins, location unknown, with one assay reported at 467 ounces silver per ton.

J.A. GORE PROPERTY (14)

John A. Gore currently owns five claims in the NE 1/4, S 1/2 and SE 1/4, N 1/2 of lot 12, concession III and in the SW 1/4, N 1/2 and NW 1/4, SW 1/4, S 1/2 of lot 11 concession III, Bryce Township. The claims are underlain by coarse-grained, poorly sorted pyroclastic breccia that has been intruded by quartz and feldspar porphyry dikes and mafic dikes. The rocks are carbonatized and strongly schistose in a northwest direction.

In 1974, a ground VLF electromagnetic survey was carried out by J.A. Gore over a part of the claims. Two strong anomalies were outlined on the claims (Assessment Files Research Office, Ontario Geological Survey, Toronto). The northern anomaly lies wholly within Heather Lake, approximately parallel to the northern shore of the lake and the other lies to the west of the island in the southwestern part of the lake. No further work has been reported.

GOSSAN RESOURCES LIMITED (LIBBY PROSPECT) (15)

Gossan Resources Limited currently owns 28 leased claims (T 50982 to T 50989; T 50965 to T 50974; T 51721 to T 51723; T 51727 to T 51730; T 51690 to T 51691; T 53151) and a 140 acre Veterans Lot. The Veterans Lot is the S 1/2 of lot 9, concession III, Bryce Township. The leased claims are located in the SW 1/4, NW 1/4, N 1/2 of lot 8, concession II; N 1/2 of lot 9, concession II; NE 1/4, N 1/2 of lot 10, concession II; NE 1/4, NW 1/4, SW 1/4, S 1/2 of lot 8, concession III; NW 1/4, SW 1/4, SE 1/4, N 1/2 of lot 8, concession III; N 1/2 of lot 9, concession III; lot 10, concession II; NE 1/4, SE 1/4, N 1/2 of lot 11, concession III, and NE 1/4, S 1/2 of lot 10, concession III, Bryce Township. This present group of claims was originally known as the John B. Libby claims and the Libby-Kirkham Syndicate claim group. These two claim groups have been described in detail by Moorhouse (1944):

> "John B. Libby controls 11 claims and a veteran lot in the southwestern part of Bryce Township. Nine claims and the veteran lot are located in concession III: T. 25,164 and 25,230 (southwest and southeast quarters of the north half of lot 10); 25,235 and 25,236 (southwest and southeast quarters of the north half of lot 9); 24,232 (northeast quarter of the south half of lot 11); 25,227 to 25,229 and 24,479 (south half of lot 10); and the veteran lot in the south half of lot 9. The other two claims are in concession II: 24,480 and 24,305 (northeast and southeast quarters of the north half of lot 10). The claims are underlain by intermediate to acid agglomerates and lava flows, except at the southeast corner of the group where Cobalt conglomerates are exposed.
>
> The existence of auriferous mineralization on this property has been known for a long time. The claims include the old "Borgford" property, which is described in an earlier report of the Department of Mines. In September, 1936, some work was done on the property by Erie Canadian Mines, Limited (a subsidiary of Sylvanite Gold Mines), and some interesting values were obtained from it. In the spring of 1940 diamond-drilling and extensive trenching and sampling were carried out by Agaura Explorations, Limited, on the Libby claims and the

Libby-Kirkham group adjoining to the east. Values obtained were not such as to encourage them to do further work.

The volcanics have been heavily sheared and carbonatized, especially in the southeastern claims. The direction of shearing is northwest, and the porphyry dikes and bodies generally tend to follow this direction, not only in the heavily schisted area but in less sheared outcrops to the west. Throughout the area the strike of bedding and flow contacts is northeast, so that they are cut by the schistosity at a high angle. Diabase dikes as much as 50 feet in width cut the volcanics.

The principal mineralization so far discovered is associated with porphyritic intrusives, feldspar porphyries or albitites, and carbonate albitite. These rocks have been described in some detail on page 11. [The page number refers to the page number of the report from which this quote was taken.]Reference was also made there to the ability of the emanations associated with these intrusives to permeate and replace the country rock, such as ellipsoidal and amygdaloidal lavas.

The principal discovery is located near the southeast corner of the veteran lot. A zone of amygdaloidal and ellipsoidal lavas in the carbonate schist has been cut by carbonate albite dikes and replaced by what appears to be a flat-lying sheetlike body of albite porphyry carrying irregular mineralized veinlets of carbonate and quartz. Inclusions of bedded tuff occur in the porphyry. The zone has been exposed by continuous trenching for a length of 250 feet, and the zone of porphyry has a maximum width of 30 feet. When sheetlike in form the porphyry appears to be 2 to 3 feet thick and is possibly more. In the western half of the workings, it seems to be more dikelike in form. Some 60 feet north of the main trench a pit about 18 feet deep has been sunk. At the bottom of the pit, porphyry containing flat-dipping quartz veins and carbonate was located. The writer is inclined to regard this as the continuation of the sheetlike body exposed in the main trench, which would thus dip north.

Mineralization is chiefly pyrite occurring as cubic crystals in the porphyry sheets and as massive blebs and cubes in quartz and quartz-carbonate veins. Chalcopyrite was noted with quartz in one place. Considerable massive pyrite in blebs in massive white quartz was taken from the pit mentioned. A specimen of this submitted to the Provincial Assay Office yielded 0.32 ounces in gold. Systematic sampling by Agaura Exploration is said to have revealed a few assays as high as 0.21 ounces, but most were less than 0.1 ounces and about half gave no gold. Some of the best and most consistent values were obtained from the bottom of the pit. Channel samples taken by Agaura in the carbonate schist are said to have yielded no values.

About 1,600 feet west and a little north of this find, a zone of mineralization and albitization containing numerous quartz-carbonate veins has been exposed throughout the full length of an 80-foot trench. The country rock is carbonatized greenstone and schist, and the veins cutting it are flat-dipping, irregular, and mineralized with very coarse cube pyrite. Fine-grained cube pyrite is disseminated in white albite zones flanking the veins. A specimen of fractured coarse pyrite, with a little finer-grained sulphide gave 0.05 ounces of gold on assay at the Provincial Assay Office. Disseminated pyrite in the fine-grained albitite gave only 0.02 ounces. Channel samples by Agaura are reported to have yielded traces to 0.04 ounces in gold, and a grab sample gave 0.14 ounces in gold. South of this zone two carbonate-albite porphyry dikes as much as 5 feet in width have been exposed. The size of this zone is impressive, but there is no clue to its probable extent beyond the exposures in the trench.

In the northwest corner of the group a pit was put down in intermediate lavas cut by fractures striking at various angles. One, striking N. 10°W., carried as much as 20 inches of sulphide mineralization, including pyrite, chalcopyrite, quartz, carbonate, and wall rock. Malachite and azurite are also present. Good values are said to have been obtained, but the mineralization is irregular and quite limited in width and length.

To the south, on claim T. 24,480, an irregular lenticular zone of sulphide impregnation in sheared agglomerate has been explored by stripping and testpitting, the quite variable strike of the zone being controlled by the schistosity only in a very general way. Disseminated pyrite is the dominant sulphide, and some chalcopyrite was observed.

The Libby-Kirkham Syndicate controls 7 claims in Bryce Township: T. 24,459 to 24,461, 24,464 to 24,466, and 25,232 (south half of lot 8, concession III, and north half of lot 8, concession II).

The claims are underlain by carbonatized, sheared intermediate and acid volcanics and, in the southeastern part, by Cobalt shales and conglomerates and Nipissing diabase sills. The schists strike northwest-southeast, though bedding and other original structures strike generally north of east.

A considerable amount of trenching has been done on the property. A carbonate zone 6 1/2 chains east of the boundary between this group and the Libby group to the west has been exposed by 2 deep trenches. The east one is 190 feet long; and the west one, lying 70 feet to the northwest, is 140 feet long. The schist, which is extremely friable and platy, is cut by several dikes of lamprophyre, and possibly also by porphyries. A number of zones, ranging from a quarter of an inch to 3 feet in width and mineralized with streaks and seams of pyrite and some quartz and carbonate, are exposed in the walls of these trenches. Chalcopyrite is also present. As reported by Erie Canadian Mines, Limited, interesting values from 0.4 pennyweights over 4.2 feet to 8.4 pennyweights over 2 feet were obtained in channel sampling. It seems doubtful if any one zone is traceable for any great distance along the strike.

South of these trenches, 250 feet east of the west boundary of the group, a feldspar porphyry dike, which strikes about N.65°W. and is 12 feet wide, has been opened up by 4 cross-trenches over a length of 155 feet. The porphyry dike is bordered on the south side by a width of from 3 to 13 feet of carbonatized porphyry and cuts carbonate schist. The dike is cut by flat-dipping quartz-carbonate veins, mostly 2 inches or less in width. Pyrite occurs in porphyry and in quartz-carbonate veins as cubes and also occurs as large massive pockets as much as 12 inches in diameter. The veinlets strike roughly perpendicular to the strike of the dike. Flat-dipping, slickensided chloritic shear structures cut veins and porphyry, and a persistent narrow fracture occupies the centre of the dike. Channel sampling by Agaura is reported to have yielded from nil to 0.02 ounces per ton of gold. A grab sample of porphyry mineralized with cubic pyrite gave 0.08 ounces on assay at the Provincial Assay Office".

From 1962 to 1967, Decaire Mining Company Limited put down 23 holes for 6329 feet (Assessment Files Research Office, Ontario Geological Survey, Toronto). These holes were drilled in the schistose, strongly carbonatized pyroclastic rocks east of Heather Lake. In 1974, the company carried out detailed geological mapping, magnetic, and electromagnetic surveys.

During the geological mapping, seven of 16 known mineral showings were sampled and assayed by the company for gold and silver. A 1-foot wide shear zone, 1600 feet northeast of Heather Lake which trends N10°W and dips 85° east has gold associated with a 2-inch wide pyritiferous quartz vein. Three samples assayed by the Decaire Mining Company Limited were found to contain between 0.02 to 0.32 ounce gold per ton and traces of silver (Assessment Files Research Office, Ontario Geological Survey, Toronto). A grab sample of the rusty shear zone taken by the field party and assayed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, contains 0.22 ounce gold per ton. A N35°W trending 3-inch wide shear zone is found 900 feet south-southeast of the previous location. Decaire Mining Company Limited took three samples across the width of the shear zone which have a weighted average of 0.76 ounce gold per ton over 2.8 inches. A grab sample from the same shear zone contains 0.98 ounce gold per ton (Assessment Files Research Office, Ontario Geological Survey, Toronto). Silver values range between a trace and 0.43 ounce per ton. A N50°W trending 2- to 3- foot wide mineralized shear zone is found 1050 feet east-southeast of Pike Lake. [Pike Lake is not an approved name, but has been added to the map (*see*

Map 2501, in back pocket) as a reference point 1 inch southeast of Heather Lake.] This mineralization consists of quartz, quartz-carbonate veins with 3 to 5 percent pyrite, and two samples taken by Decaire Mining Company Limited were assayed and found to contain 0.06 and 0.15 ounce gold per ton and traces of silver (Assessment Files Research Office, Ontario Geological Survey, Toronto). Four thousand feet east of Pike Lake, a grab sample of a highly sheared zone within a porphyritic rhyolite breccia was found to contain 0.44 ounce gold per ton and 0.62 ounce silver per ton. Two samples from a 5 cm wide pyritiferous shear zone in carbonatized intermediate metavolcanics taken by the field party in the same vicinity as the porphyritic rhyolite breccia were assayed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, and found to contain 0.18 and 0.26 ounce gold per ton.

An electromagnetic survey by Decaire Mining Company Limited delineated three anomalies with northwest trends which were interpreted by the surveyor to be caused by pyritiferous tuffs. Since the strike of the metavolcanics in the claim group has been determined by the present survey to be northeast, the electromagnetic anomalies may represent pyritiferous shear zones.

CLAIRE HAACKE PROPERTY (16)

Claire Haacke is the owner of a single patented claim (T 24245) in the SE 1/4, N 1/2 of lot 10, concession V, Bryce Township. This claim is part of the former Palmer-Vaughan Property and the description of this property by Moorhouse (1944) is found under the Touzin claims (Touzin (51)) in this present report.

D.C. HILL PROPERTY (17)

D.C. Hill owns a single patented claim (T 24225) in the NW 1/4, S 1/2 of lot 7, concession V, Bryce Township. The claim is totally underlain by the Britcanna Porphyry. No assessment work information is on file for this claim.

BRUCE HOLMES PROPERTY (WHITTON PROSPECT) (18)

Bryce Holmes currently owns three patented claims (T 19434 to T 19435; T 23279) in the SW 1/4, SE 1/4, N 1/2 of lot 6, concession VI and the NW 1/4, N 1/2 of lot 5, concession VI, Bryce Township. These claims are underlain by massive medium-grained mafic flows which have been overlain by matrix-supported conglomerate of the Gowganda Formation. The three claims were once owned by George Whitton and have been described in detail by Moorhouse (1944):

> "George Whitton owns claims T. 19,434 to 19,436 and 23,279 (northeast, southeast, and southwest quarters of the north half of lot 6 and the northwest quarter of lot 5 in concession VI) in Bryce Township. The claims are underlain by coarse diabasic greenstone and pillow lavas, which contain some iron formation and are cut by a porphyry dike. Cobalt conglomerates also outcrop on the north boundary of the east claim.
>
> The chief workings on the property are 3 pits. One of these, on claim T. 23,279, has been sunk 10 feet on a band of iron formation interbedded with coarse greenstones, which are cut by porphyry. A second pit, on claim T. 19,436, has been sunk on a fractured zone in coarse greenstone, which trends about N.80°W. The gangue includes cherty quartz and later carbonate. It is mineralized with pyrite, sphalerite, and pyrrhotite. The third pit, on claim T. 19,434, has been sunk to a depth of 20 feet or more on the west end of a silicified shear zone in fine-grained greenstone. The shear zone is exposed for 700 feet or more to the east and is slightly rusty owing to the presence of a little sulphide."

A. JUTRAS [1963] (19)

A. Jutras formerly held one claim in the SW 1/4, N 1/2 of lot 5, concession VI, Bryce Township. The ground is underlain by massive and pillowed flows in the west and Gowganda Formation conglomerate in the east. In 1963, three diamond-

drill holes were sunk in the metavolcanics for a total length of 340 feet (Assessment Files Research Office, Ontario Geological Survey, Toronto).

KARP PROPERTY (20)

The Karp Property consists of nine leased claims (MR 18612 to MR 18617, MR 18619 to MR 18620, MR 18652) owned by Gladys Karp and one patented claim (MR 18571) owned by Ronald Karp. These claims are found on the N 1/2 of lot 1, concession II; SW 1/4, SE 1/4, S 1/2 of lot 1, concession III; NE 1/4, SE 1/4, N 1/2 of lot 2, concession II, Tudhope Township. Underlying the claim group are schistose, carbonatized intermediate to felsic pyroclastic rocks of the Skead Group which have been intruded by small carbonatized feldspar porphyries. The southern part of the claim group is underlain by Gowganda Formation conglomerate and argillite.

The main showing consists of a strong N60°W trending shear zone containing a 1.5- to 3-foot wide assemblage of quartz carbonate stringers (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). A 50-foot deep, 12 by 6 foot-inclined shaft, on claim MR 18571 was sunk on the shear zone around 1928. A 750-foot length of this shear zone has been examined by E.W. Karp by excavating 14 trenches. Grab samples from the vein in the shaft range in value from 0.06 to 0.66 ounce gold per ton. Samples taken from the trenches along the shear zone have values ranging from 0.01 ounce to 2.24 ounces gold per ton (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development, Kirkland Lake). The values are erratic, but the samples containing the highest values of gold also contain sulphides. A grab sample or carbonatized pyroclastic rocks taken by the field party from one of the trenches was assayed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, and was found to contain 0.17 ounce gold per ton and 0.27 ounce silver per ton.

The assays quoted are the result of work done by E.W. Karp, Fred Thompson of Thompson -Lundmark Gold Mines Limited, and G. Charlewood of Lake Shore Mines Limited (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake).

STAN LAVALLÉE PROPERTY [1960] (21)

Stan Lavallée formerly held nine claims in the S 1/2 of lot 12, concession I; SW 1/4, SE 1/4, N 1/2 of lot 12, concession I; SW 1/4, NW 1/4, S 1/2 of lot 11, concession I, and the SW 1/4, N 12, of lot 11, concession I, Tudhope Township. The claim group is underlain predominantly by Nipissing Diabase with Gowganda Formation conglomerate found in the southwestern quarter.

In 1960, three diamond-drill holes were drilled in the diabase for a total length of 331 feet and in 1961, six diamond-drill holes were put down for total length of 561 feet (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). Aplite and carbonate veins with minor chalcopyrite and galena were found associated with the diabase. The claims have since reverted to the crown.

HAROLD LYNCH PROPERTY (22)

Harold Lynch currently owns two leased claims (MR 27792 and MR 27793) in the S 1/2 of the N 1/2 of lot 11, concession VI, of Tudhope Township. The claims are underlain by a Nipissing Diabase sill and by Gowganda Formation conglomerate. A narrow quartz-carbonate vein, found in the northwestern corner of the SW 1/4 N 1/2 of lot 11, concession VI, strikes N80°E and dips 80°N. The width of this vein does not exceed 30 cm. Reported mineralization associated with this vein is primarily chalcopyrite, malachite, bornite, and azurite with abundant specular hematite.

In 1951, H. Lynch put down four diamond-drill holes for a total length of 460 feet. These holes were all collared in diabase and were drilled to intersect the vein. In 1959, six additional holes were put down by H. Lynch for a total length of

413 feet. One of these holes was reported to have intersected a 1-foot thick section of massive chalcopyrite. Don Hurd, in 1961, put down a single 164-foot long diamond-drill hole. A 1-foot thick section of bornite-bearing quartz carbonate vein was analyzed and found to contain 8.27 percent copper and 1.1 ounces silver per ton (Assessment Files Research Office, Ontario Geological Survey, Toronto).

NORMAN MACDONALD (23)

Norman Macdonald currently owns two claims (L 565017 and L 565018) in the NW 1/4, NE 1/4, S 1/2 of lot 10, concession I, Robillard Township. A former property worked by Macdonald was in the NW 1/4, N 1/2 of lot 10, concession II, and was described by Moorhouse (1944) as follows:

> "The MacDonald property is located in the north half of lot 10, concession II, Robillard Township, and is owned by N.C. MacDonald. The first work on the property was done in June, 1935, under the direction of H. Weeks, of Englehart, for Sylvanite Gold Mines, Limited. The property was subsequently optioned to a Mr. Castleman, who financed the drilling of 8 diamond-drill holes on this property and a ninth on the property of Moody Teeples adjoining to the north (south half of lot 10, concession III).
>
> The property is underlain chiefly by granodiorite, but in the immediate vicinity of the vein it contains the much injected, granitized termination of a tongue or roof pendant of hornblende schist, which widens to the east. The hornblende schist dips 45°-60°N. and strikes about N. 75°E. The granite and schist are cut by narrow dikes of lamprophyre (hornblende syenite) from 2 to 3 feet wide. At the west end of the vein, the granite which there forms the country rock is cut by a narrow quartz-feldspar porphyry dike. On the strike of the break, another hornblende syenite dike, which is exposed in a granite outcrop to the west, strikes N.55°E.
>
> The mineralization has been developed in a shear zone (or series of shear zones), which strikes N.35°-60°E. and has been traced by pitting and trenching for about 500 feet. Except at the extreme west end, where it forms a fractured vein 3 1/2 feet wide, quartz, the chief gangue, forms narrow veins, irregular stringers, patches, and blebs. It occurs most commonly in zones of stringers. In the wider veins it has often a sugary texture; otherwise it is pegmatitic. Fine crystalline pyrite is frequently associated with the quartz. The sulphides occur in quartz, in "granite" at the east and west ends of the break, and in hornblende schist in the central pits. In the west pit sulphides occur as seams of solid pyrite with a maximum width of half an inch. Chlorite and brown-weathering carbonate occur in the break, and a little chalcopyrite was noted in the east trench.
>
> The fracture or fractures along which the mineralization occurs has not been a plane of a significant movement. A lamprophyre dike crossing the vein has been brecciated by the fracture but has not undergone much displacement.
>
> Surface sampling by Sylvanite is reported to have shown two zones, one 19 feet long, giving 2.5 pennyweights per ton of gold over 2.6 feet; and the other 18 1/2 feet long, carrying 2.55 pennyweights over 1.7 feet. Mr. Weeks reports that he obtained 17.60 pennyweights of gold per ton over 4 feet 4 inches in one sample.
>
> Seven of the eight holes drilled are reported to have given remarkably uniform results, ranging from 2 to 5.2 pennyweights, with no blanks. The best section gave 4.8 pennyweights over 4.9 feet. Most of the widths were considerably less.
>
> The property is interesting because of the unusual geological conditions. The extensive granitization and the abundance of granite and pegmatite near the vein are not usually considered to be favourable conditions for gold deposition."

The two claims currently owned by Norman MacDonald are part of the former J.T. Mearow property listed on Map 2501 as Mearow-McCombe [1939] (29) and have been described by Moorhouse (1944):

"The property of J.T. Mearow comprises 5 claims in concession I of Robillard Township, T.24,053 to 24,057 (south half of lot 10 and northwest quarter of the south half of lot 9).

The claims are underlain by sheared pillow lavas and granodiorite. The pillows strike N.40°-50°E. and dip 30°-50°N.W. They are cut by sills of porphyritic granite and by dikes of quartz and feldspar porphyry, "bird's-eye" porphyry, and lamprophyre. "Sulphide burns" are widely distributed, especially near the contact with the granite.

Most of the work has been performed in lenticular shear zones in greenstone, which strike N.25°-50°E. and are associated with pegmatite dikes, a lamprophyre dike, and "bird's-eye" porphyry. The shear zones, which are relatively short, have a maximum length of 100 feet and a maximum width of 10 feet. Mineralization consists of fine to coarse disseminated pyrite, which occurs in quartz veins, in carbonatized greenstone, in pegmatite, and in brecciated, fine-grained aplitic zones in the shear zones. The last-named type occurs in a zone, which has a maximum width of 6 1/2 feet and a length of about 50 feet, between a dike of "bird's-eye" porphyry on the north and a finer-grained dike on the south. Mr. Mearow states that some values were obtained from three of these trenches."

MacDonald previously owned two claims in the NW 1/4, SE 1/4, N 1/2 of lot 9, concession II, Robillard Township, and in 1975 sunk two diamond-drill holes for a total length of 906 feet (Assessment Files Research Office, Ontario Geological Survey, Toronto).

M. MALAUF (24)

M. Malauf owns a single patented claim (12750) in the SW 1/4, S 1/2 of lot 8, concession II, Bryce Township. The claim is underlain by schistose, carbonatized, lapilli-tuff, and tuff that has been intruded by a Nipissing Diabase sill. This claim may be part of the Thelma Property that was noted by Burrows and Hopkins (1922, p.10).

DONNA MARCHESE (ESTIVAL PROPERTY) (25)

Donna Marchese currently owns the mineral rights to the N 1/2 of lot 9, concession V, Bryce Township, which is known as the Estival Property. There is no recent work recorded for this land, and Moorhouse (1944) gives a description of the work completed prior to 1941:

"The Estival property is located in the north half of lot 9, concession V, Bryce Township. The principal showing was discovered in 1934 by Frederick Estival near the north boundary of the lot. It is understood that in the late twenties the property was put into the Aladdin Syndicate, which is still in existence. The property was optioned to Kirkland-Hudson Bay Gold Mines, Limited, in 1935, and some diamond-drilling was done. Abundant visible gold is reported to occur in the main showing on the property. At the time of the writer's visit the trench was filled with water.

The claim is underlain chiefly by pillow lavas and related massive altered diabases and gabbro. Felsitic porphyry, hornblende syenite, and lamprophyric rocks occur as narrow dikes striking chiefly in a north-south direction. In the southeastern part of the lot, the Britcana porphyry outcrops. In the northwestern corner along the south side of the break a diabase dike 40 to 50 feet wide cuts through greenstones, terminating half way across the claim.

The structural geology appears to be simple. The Keewatin flows and the shear zones in which the mineralization is found strike N.56°-62°E. The shearing, which shows no evidence of major displacement, appears to be confined to a narrow zone of fine-grained pillow lava, which has been deformed to a platy chlorite schist. To the north and south, very massive, coarse flows show only abundant jointing.

The shear zone has been opened up by 15 pits and trenches over a length of about 2,000 feet. At the west end, alongside the diabase dike, a pit perhaps 10 feet deep has been sunk on a silicified, carbonatized shear zone, which has a total width of 3 1/2 feet and contains quartz lenses, which are cut by stringers of sugary quartz. Mineralization consists of galena, sphalerite, chalcopyrite, and pyrite. A grab sample of the best mineralized vein material submitted to the Provincial Assay Office yielded no gold. The diabase appears to be chilled against the vein. About 300 feet to the east a similar silicified zone, 7 feet wide, is cut by narrow trap dikes and is mineralized with fine-grained pyrite and a little chalcopyrite.

About 375 feet farther east, a trench has exposed considerable quantities of chalcopyrite and copper stain associated with brecciated hornblende syenite, which is cut by quartz and carbonate. Patches of massive chlorite are present. Trenches intervening between this and the preceding trench have exposed silicified shear zones and, in one case, rather heavy pyrite mineralization. Considerable quantities of earthy hematite are found in one pit. Farther east the break is hidden in swamp and drift. Some 500 feet to the east it again shows up, and 1,200 feet east, just south of the north boundary of the lot, the most important discovery was made. In a trench 85 feet long a shear zone about 9 feet wide is said to have been exposed. This is reported by W.T. Robson to be cut by 2 feet of glassy quartz carrying pyrite, chalcopyrite, sphalerite, galena, and visible gold. Mr. Robson reports that interesting values were obtained from the vein quartz but only traces from the schist on either side. While some of the quartz is white or glassy, specimens noted on the dump and in a trench to the east show greyish-brown, greasy quartz with considerable amounts of sphalerite and fine-grained, sericitic, aplitic material. In polished section the sphalerite is found to be dotted with numerous fine, regularly distributed dots and streaks of chalcopyrite. White carbonate and pink, brown-weathering carbonate are abundant in the schist. In the trench to the east a zone of schist 4 to 6 feet wide containing 3 inches of glassy quartz is exposed. Specimens assayed at the Provincial Assay Office, including one of glassy quartz containing green (chloritic?) quartz and pyrite and one of fine-grained, grey quartz containing sphalerite, gave no gold.

Some diamond-drilling was done by Kirkland-Hudson Bay on the break at the two easternmost trenches. The results obtained are unknown.

A considerable amount of work has been done by Mr. Estival on several minor shear zones and quartz veins. Along the south edge of the outcrop near the Estival farm buildings a zone of silicification 75 feet wide is exposed. The zone is barren-looking, and it is not known whether or not any values were obtained from it."

N.C. McCREARY PROPERTY (26)

N.C. McCreary owns three patented claims (MR 5000 to MR 5002) in the NE 1/4, NW 1/4, SW 1/4 of the S 1/2 of lot 7, concession I, Tudhope Township. The claims are underlain by schistose, metamorphosed metavolcanics that have been intruded by Nipissing Diabase. No information is available for these claims either in the Assessment Files in Toronto or in Kirkland Lake.

JACK McGALE PROPERTY (27)

Jack McGale currently owns two patented claims (MR 17340, MR 17342) and 3 leased claims (MR 28603 MR 28604, and MR 28157) in the NW 1/4, NE 1/4, S 1/2 of lot 12, concession III; SE 1/4, NE 1/4, N 1/2 of lot 12, concession III, and the SW 1/4 N 1/2 of lot 11, concession III, Tudhope Township. These claims are part of a group that used to be known as the Doyle-Regan-Holden claims (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development, Kirkland Lake). The original trenches on the property are reported to have been blasted around 1910. The property is underlain by a Nipissing Diabase sill.

The main carbonate veins on this property have northerly trends with northeasterly-trending cross veins. The veins, some of which are associated with aplite dikes, are reported to vary in width from 1 to 8 inches. Chalcopyrite, bornite, and specular hematite are associated with the carbonate veins.

In 1951, Jack McGale examined the old trenches with the hope of finding silver mineralization. In 1962, he put down a diamond-drill hole 247 feet long, all of which was in diabase (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development, Kirkland Lake). No silver was found on the property.

BERTHA McNAUGHTON (PAYNE PROPERTY) (28)

Bertha McNaughton owns the patented land found in the W 1/2, N 1/2 of lot 7, concession I, Tudhope Township. This part of the land was originally owned by J.R. Payne who had the N 1/2 of lot 7, concession I, as a homestead lot. The Frontenac Gold Mine was reported to have had a 250-foot deep shaft sunk on a shear zone in the western part of this property (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). The property is underlain by intermediate tuff and lapilli-tuff that has been intruded by contaminated granodiorite which has a dioritic composition. A shear zone striking S80°E dipping 85°N was trenched by J.R. Payne in 1942. Four samples of rusted quartz with chalcopyrite and pyrite mineralization from this trench were submitted for assay. The assays range from 0.02 to 0.32 ounces gold per ton (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake).

MEAROW-McCOMBE [1939] (29)

J.T. Mearow and Elgin McCombe formerly owned two claims in the NW 1/4, N 1/2 of lot 12, concession V, and the SE 1/4, S 1/2 of lot 12, concession VI, Bryce Township. This property has no recent work associated with it and has been described by Moorhouse (1944) as follows:

> "The Mearow-McComb property comprises 2 claims in Bryce Township, T. 25,001 and 25,125 (northwest quarter of the north half of lot 12, concession V, and southeast quarter of the south half of lot 12, concession VI). It is owned J.T. Mearow and Elgin McCombe.
>
> The claims are underlain by sheared platy hornblende schists and rather massive granodiorite. The schists in many cases have more or less well preserved, deformed pillows and are injected by veinlets of pegmatite and quartz. The schistosity strikes N. 50°-65°E. and dips vertically or steeply north. The contact of the granite and greenstone as a whole strikes N.40°E.
>
> The principal workings are located near the granite-greenstone contact on a heavy shear zone trending N.62°E. and consist of trenching over a length of 60 feet, with a maximum width of 20 feet. The mineralized zone has been cut by pegmatite dikes. Some parallel the schistosity, but one forms a blunt rounded tongue extending for 3 feet into the shear zone. Microscopic examination of the pegmatite paralleling the schist reveals considerable shearing and granulation. At the west end of the trenching the shear zone appears to be cut off by a fault or shear zone trending N.50°W and having apparent movement of the west side to the north.
>
> The visible mineralization is chiefly fine-grained, cubic pyrite, distributed irregularly through the zone. The best pyrite is associated with quartz. Some of the quartz is white and pegmatitic, but much of it is grey and greasy and occurs in narrow lenses and stringers with a maximum width of 6 inches. Carbonate occurs in some abundance, being white, purplish, or salmon pink in colour. The quartz veins are locally cut by carbonate.
>
> Interesting but rather erratic values were obtained, according to Mr. Mearow. He states that sampling by F. Austin, of Teck Hughes Gold Mines, Limited, gave assays as high as 17.20 pennyweights of gold over 1 foot, though most varied from a trace to 2 pennyweights. Six-inch channel samples taken by Mr.

Mearow and assayed at the Provincial Assay Office gave values from nil to 0.43 ounces of gold per ton. Unfortunately to the east the break is entirely covered by drift, so that nothing is known of the possible extension of the zone. There is evidence in the topography of a rather persistent structural break on the strike of the zone to the east. No mineralization of importance is exposed to the west."

Edward Miller currently owns two patented claims (T 19119; T 20917) on the SE 1/4, S 1/2 of lot 11, concession III and the NW 1/4, N 1/2 of lot 10, concession II, Bryce Township. The two claims are underlain by schistose, carbonatized tuffs, lapillituffs and very coarse grained pyroclastic breccia. Quartz and feldspar porphyry dikes and mafic dikes have intruded the metavolcanics. The schistosity and shearing is in a northwest direction. No work has been reported for these two claims.

MERICO EXPLORATIONS LIMITED [1956] (30)

Merico Explorations Limited formerly held two claims in the SW 1/4, SE 1/4 N, 1/2 of lot 12, concession VI, Tudhope Township. These claims are underlain by a sill of Nipissing Diabase and Gowganda Formation sediments. Originally these claims were owned by the Toledo Silver Mines Limited and the claim in the SE 1/4 was known as the Bradshaw claim, Toledo Mine (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). The Toledo Shaft, not seen by the field party, was reported to be on the northern part of the claim and was 250 feet deep. The claim was owned by Mr. Brazeau in 1951, who was reported to do a little work on the property each year. The mine dump contained a little vein material of calcite with chalcopyrite, specular hematite, and traces of cobalt bloom. The vein, trending S85°E and dipping 70°S, was found in a 3- to 4-foot wide fracture zone and was traced for over 500 feet by stripping and small trenches (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). The vein was not associated with any aplite dikes.

The main showing, on the SW 1/4 claim, trends N70°E, has a vertical dip and has been trenched for 110 feet. The showing is a 5-foot wide shear zone containing carbonate veins mineralized with chalcopyrite, bornite, and abundant specular hematite (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). Assay results from sampling done by Teck-Hughes Gold Mines Limited in 1953 are as follows: western end of the trench, 3.9 percent copper over 5.5 feet; 50 feet east of the western end to the trench, 6.25 percent copper over 2.6 inches and 10 feet beyond that, 8.8 percent copper over 2.6 inches. A grab sample was analyzed to have 25 percent copper. Ethel Copper Mines Limited, which had a mine in neighbouring James Township, carried out a self potential survey in 1953, and delineated an anomaly over the main showing (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). Merico Explorations Limited, incorporated in 1955, put down three diamond-drill holes, in 1956, under the trench on the SW 1/4 claim intersecting the mineralized horizon at the 50- and 100-foot levels (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake).

EDWARD MILLER PROPERTY (31)

Please see the last paragraph of the account for Mearow-McCombe [1939] (29).

MIN-ORE MINES LIMITED [1959] (32)

Min-Ore Limited formerly held six claims in the SW 1/4, SE 1/4, NE 1/4, S 1/2 of lot 12, concession V, and the NW 1/4, NE 1/4, SW 1/4, S 1/2 of lot 12, concession IV, Tudhope Township. This claim group is underlain by Nipissing Diabase.

The Assessment Files in the Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake, give no indication as to when these claims were staked. The file indicates some trenching was carried out as

well as two diamond-drill holes which were drilled to an accumulated length of 330 feet. Both holes were drilled in 1959 on the claim in the SW 1/4, S 1/2 of lot 12, concession V, and were logged as intersecting massive chalcopyrite up to 7.5 feet in thickness.

J. MORRIS PROPERTY (33)

J. Morris currently owns four claims (L 550916 to L 550919) in the S 1/2 of lot 4, concession I, Dack Township. The claims are underlain by bedded, moderately sorted tuff, lapilli-tuff, tuff-breccia, and pyroclastic breccia. In 1951, a 60- foot long diamond-drill hole was sunk by D. Tully on these claims and the core was logged as being medium-grained diabase (Assessment Files Research Office, Ontario Geological Survey, Toronto). Diabase was not found by the field party to outcrop anywhere on this claim group.

A. MOWAT (HILLCREST PROPERTY) (34)

A. Mowat currently owns 12 claims (L 512419 to L 512425; L 550723 to L 550739) in the S 1/2 of lot 6, concession VI; N 1/2 of lot 5, concession VI; NE 1/4, SE 1/4, S 1/2 of lot 5, concession VI and the SW 1/4, NW 1/4, S 1/2 of lot 4, concession VI, Dack Township. The claims are underlain by pillowed and massive flows. The claims in the N 1/2 of Lot 5 Concession VI, the Hillcrest Property, are highly sheared and the main showing is a carbonate fuchsite schist. This property has been described by Moorhouse (1944) as follows:

> "The Hillcrest property is located on the north half of lot 5, concession VI, Dack Township. The members of the syndicate are J.P. McPherson (on whose farm the property is located), S.J. Reynaud, and J.J. Towne. The vein has been known for many years and is mentioned in the report on the Blanche River area. A 6by 9-foot shaft has been sunk to a depth of 45 feet on the best looking part of the vein. From July 8, 1939, to January 8, 1941, the property was under option to Alfred Coutts, who drilled 17 shallow holes, most of them along the main break. Three deeper holes were drilled at an earlier date by the syndicate.
>
> Near the principal vein the country rock is carbonate schist, which is developed in massive, medium-grained, silicified dioritic greenstones. To the north of the vein near the granite contact platy, contorted, fine-grained hornblende schists dominate. These rocks have been injected by narrow dikes of feldspar porphyry, aplitic porphyry, lamprophyre, and one dike of fine-grained diabase. Some of the lamprophyres carry fragments of granite and other rocks. Considerable silicification is in evidence in the veins and lenses in the hornblende schists and in irregular anastomosing blotches and streaks in the dioritic types.
>
> The shearing in the schistose rocks strikes N.45°-75°E, averaging about N.55°E. Most of the dikes parallel the schistosity. The main break along which mineralization is located strikes N.38°-45°E. It thus seems to diverge slightly from the dominant direction of schistosity. Just west of the road (see Figure 4), it turns to strike parallel to the schistosity. East of the road the break appears to comprise a number of en echelon shear zones striking generally N.50°-70°E. along a zone that trends N.42°E.
>
> The principal values are carried by a milky white, massive well-fractured quartz vein 2 to 3 feet wide. There is some evidence of a second stage of quartz formation. In a trench 130 feet east of the shaft, the quartz has a delicate mauve tint and is apparently quite barren. The vein cuts heavily carbonatized schist containing considerable quantities of bright-green chromiferous mica. The green mica also occurs in seams and fractures in the quartz itself. Brown carbonate is found in veinlets cutting the quartz vein as well as in the wall rock. The principal mineralization is pyrite in cubes and pyritohedra, which occur along micaceous seams in fractures in the quartz, disseminated, sometimes in very fine grains in apparently massive quartz, and also as disseminated cubes in the carbonate schist.

The vein is exposed at intervals over a length of at least 300 feet, though the present condition of the trenches makes it uncertain whether the vein is continuous throughout this length.

Rather consistent values are said to have been obtained from the vein in the vicinity of the shaft, west of the road. The property was sampled in 1929 by Clarence L. Heath. He reported an average value of 0.20 ounces in gold over a width of 34 inches for a length of about 200 feet. Drilling by Alfred Coutts is reported by J.J. Towne to have yielded from 0.02 to 0.24 ounces in gold over 5 feet true width for a length of 225 feet. The holes were drilled at 25-foot intervals to intersect the vein at a depth of 25 feet. The shoot indicated is said to be open to the west. No visible gold has been reported from the vein. The wall rock appears to carry only negligible values.

East of the road, on this property and on the claims of Mrs. Alma McPherson and Harry Grant, to the east and northeast, respectively, mineralized and barren quartz with wide zones of carbonate schist have been exposed by occasional trenches. In these workings quartz is found as stringers, zones of silicification, and veins from 3 to 8 feet wide. Some of the veins are flat-dipping and vuggy. Carbonate occurs in the wall rock, in veinlets in schist, and in quartz. In one trench there is exposed at least 15 feet of quartz, distributed in 3 veins, together with zones of stringers in the schist. Green mica is abundant in the schist. In most cases, the mineralization is sparse. In one trench a little bornite was noted in massive white quartz.

About half a mile to the southwest on the Farmer (formerly Staples) lot, rusty-weathering carbonate schist containing chrome mica, pyrite, and milky quartz stringers has been exposed by a shallow trench. This may represent the continuation of the Hillcrest break. A pyrite-bearing, reddish porphyry dike cuts the schist in this vicinity."

In 1944, Dack Creek Mines Limited assumed control of the Hillcrest Property and sunk seven diamond-drill holes for a total length of 2636 feet as well as 10 other holes with unknown footage. In 1945, three additional holes were sunk for a total length of 550 feet (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). In 1962, Solmino Gold Mines Limited acquired the Hillcrest Property and another nearby claim group and a geological report was written. Kimo Gold Mines Limited completed some trenching in the region of the main showing in 1969 and 1970 (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake).

The field party sampled the fuchsite-carbonate schist of the main showing and it was assayed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, and was found to contain 0.02 ounce gold per ton.

ELLEN NIELSEN (35)

Ellen Nielsen currently owns one leased claim (L 397014) on the SE 1/4, S 1/2 of lot 9, concession VI, Bryce Township. The claim is underlain by interbedded pillowed and massive flows. A northeast-trending diabase dike intrudes the metavolcanics. Julius Nielsen of Haileybury excavated a 45 m long trench trending N70°E in sheared metavolcanics. The trench, which is deepest at its southwestern end, contains vein quartz with some pyrite. In 1974, a 3591 pound bulk sample from the trench was milled by the Timiskaming Testing Laboratory in Cobalt and an assay of 0.074 ounce gold per ton was returned. Later in 1974, a 6899 pound sample from the trench was tested by the same Laboratory and the result of the assay was 133.99 ounces silver per ton (Assessment Files, Resident Geologist's Office, Ministry of Northern Development and Mines, Kirkland Lake). In 1975, Julius Nielsen carried out a VLF electromagnetic survey on east-west lines across the claim. A grab sample of the quartz vein was taken by the field party and was assayed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, with negative results.

NORTHERN SILVER FOX RESOURCES INCORPORATED (SILVER JACKPOT DEPOSIT) (36)

Northern Silver Fox Resources Incorporated owns five leased claims (L 496559 to L 496560; L 475794 to L 475796, inclusive) in the NW 1/4, S 1/2 of lot 12, concession VI; NW 1/4, SW 1/4, SE 1/4 S, 1/2 of lot 11, concession VI; SW 1/4, S 1/2 of lot 10, concession VI, Tudhope Township and holds another seven claims (L 476735 to L 476736; L 494537 to L 494541, inclusive) in the SW 1/4, SE 1/4, S 1/2, lot 12, concession VI; N 1/2 lot 12, concession V, and NW 1/4, N 1/2, lot 11, concession V, Tudhope Township. The claims are all underlain by a medium-grained Nipissing Diabase sill. Aplite dikes with associated bornite, specular hematite, and chalcopyrite-bearing veins are found in the diabase.

These claims cover an area that has undergone extensive prospecting and exploration for both silver and copper. The first recorded work is by the Silver Alliance Mines Limited, later reorganized under Keneus Mines Limited. The claims held by these companies were in the SE 1/4 and NE 1/4 of the S 1/2 and SE 1/4, NE 1/4, NW 1/4 of the N 1/2 of lot 12, concession V; the main showing is found on the NE 1/4, NW 1/4 of the N 1/2 of lot 12, concession V. In 1909, a 100-foot deep shaft was sunk with 200 feet of attendant crosscutting on a 3-inch wide vein containing pure silver in places (Canadian Mining Journal, 1910, p.505). The strike of the 3-inch wide carbonate vein is N76°E. Besides silver, cobalt bloom was noted in the vein along with abundant bornite and chalcopyrite. In 1927, some trenching and stripping was done on the property (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). The site of this showing was visited by the field party, and as no outcrop was found in the immediate vicinity, the mine dump was examined. Calcite veinlets containing bornite and chalcopyrite were seen in fine-grained equigranular diabase rubble found around the old pits. A. Quesnell later owned three claims in the NE 1/4, N 1/2 of lot 12, concession V; SE 1/4, NE 1/4, S 1/2 of lot 12, concession V, contained the shaft of the Silver Alliance Mine.

A vein system on the claim in the NE 1/4, S 1/2 of lot 12, concession VI, was exposed in a trench 60 feet long and 6 feet deep (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). This system strikes to the N77°E and is reported to contain cobalt arsenides and native silver in carbonate veins and the chloritized wall rock.

Diamond drilling has been carried out in the western part of the claim group. In 1961, Donald Burk put down a single diamond-drill hole of unknown depth in the NW 1/4, S 1/2 of lot 12, concession VI, Tudhope Township, intersecting medium-grained diabase and minor calcite veins containing specular hematite and chalcopyrite (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). Claude Cook put down two diamond-drill holes for a total length of 204 feet on the claim in the NE 1/4, N 1/2 of lot 12, concession V, intersecting medium-grained diabase and minor calcite veins with bornite and chalcopyrite (Assessment Files Research Office, Ontario Geological Survey, Toronto). In 1961, G.S. Welsh put down a 101-foot long diamond-drill hole on the claim in the NE 1/4, S 1/2 of lot 12, concession VI, and intersected medium-grained diabase (Assessment Files Research Office, Ontario Geological Survey, Toronto). In 1962, Ethel Copper Mines Limited sunk a 505-foot long diamond-drill hole in the SW 1/4, S 1/2 of lot 12, concession VI, and intersected massive, medium-grained diabase.

The main showing on the property of Northern Silver Fox Resources Incorporated is on claim L 475795 in the SW 1/4 of the S 1/2 of lot 11, concession VI, and is known as the Silver Jackpot Deposit. The original discovery of the deposit was made in 1909 by the United States Silver Mines Limited who sunk a 100-foot deep shaft the same year. The mine was then abandoned that year owing to the lack of operating capital. In 1951, Don Hurd dewatered the shaft for the Silver Jackpot Mines Limited and discovered a number of bags of silver ore at the bottom of the shaft (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). In addition to dewatering the shaft, surface stripping and blasting was carried out in the vicinity of the shaft.

In 1977, the Silver Jackpot Deposit was restaked by Orien Venne, and in 1979, the claims were transferred to Northern Silver Fox Resources Incorporated. Figure 17 shows the geology of the Silver Jackpot Deposit and associated veins. The main carbonate vein has been trenched for a length of 485 m and trends S32°E. At the main shaft this vein is intersected by a 152 m long carbonate vein trending N60°W. North of the shaft, the main vein then splays into several veins. The highest silver values are reported to occur at the intersection of these two veins within the shaft. Assays of 119.7 and 1079 ounces silver per ton have been reported from the N60°W trending vein exposed in the shaft (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). The vein system trending N60°W is a complex of aplite diklets, carbonate veins, and massive diabase. This vein complex pinches and swells along strike and has been seen to vary between 40 and 90 cm in thickness. Massive pyrite occurs in seams less than 5 mm thick and on the joint planes next to a minor fault. Chalcopyrite and specular hematite occur with the carbonate veins. A grab sample collected by the field party from this vein system and analyzed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, contained very minor silver and 1.20 percent copper. The northerly trending main vein system contains an aplite dike that was observed to vary in width from 3 to 15 cm. The carbonate vein occurring with this dike varies between 2 and 5 cm in thickness and contains pyrite, chalcopyrite, cobalt bloom, and specular hematite. A grab sample taken from the intersection of the main vein and a minor cross vein was analyzed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, and contains 0.24 ounce silver per ton, 0.10 ounce gold per ton, and 2.58 percent copper. As seen in Figure 17, assay values obtained by the company from samples taken from carbonate veins in the trenches are uniformly low (Assessment Files Research Office, Ontario Geological Survey, Toronto). Diamond drilling and subsequent assays taken across the veins failed to return significant silver values.

Exploration on the Silver Jackpot Deposit consisted of opening pits and trenches along the aplite-carbonate vein complexes; 12 diamond drill-holes were drilled in 1976 and 1977 for a total length of 1316 feet (*see* Figure 17); and geological, magnetic, electromagnetic, and radiometric surveys were carried out in 1977. During the summer of 1980, Northern Silver Fox Resources Incorporated were driving an adit southeasterly along the main vein towards the main shaft.

Eight hundred m east of the shaft and east of the beaver pond, two vein complexes occur in medium-grained massive diabase. The southern complex consisting of a calcite vein which strikes N20°W and then curves to N20°E can be traced for 100 m. The vein pinches and swells along strike and contains 3 cm wide cross veins which concentrate the sulphides. Sulphides consist of chalcopyrite, pyrite, and specular hematite. The northern vein complex trends northeasterly with variation in strike from N40°E to N70°E and can be traced for 270 m. The complex consists of two bifurcating subparallel carbonate vein systems. The east system consists of a mineralized zone 3 to 3.6 m wide, consisting of irregular, northerly-trending carbonate veinlets and older easterly-trending veinlets. The easterly-trending veinlets contain hematite and chalcopyrite. In the northerly- trending veins and veinlets, specular hematite is the predominant metallic mineral. A chip sample taken by the field party across a 16 cm wide carbonate vein containing specular hematite, chalcopyrite, and pyrite was analyzed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, and found to contain a trace of silver and 1.23 percent copper. The west vein system consists of a mineralized zone 6 m wide with two carbonate veins containing specular hematite, bornite, chalcopyrite, and pyrite. The carbonate veins, up to 6 cm thick, pinch and swell along strike and have a mineralogy varying between calcite cores and specular hematite cores. A composite sample taken from a mineralized part along the western vein was collected by the field party and analyzed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, and it contains 1.04 ounces silver per ton, 0.04 ounces gold per ton, and 3.59 percent copper. The outcrop containing these veins had been stripped, washed, and shallow trenches had been blasted into it when seen by the field party.

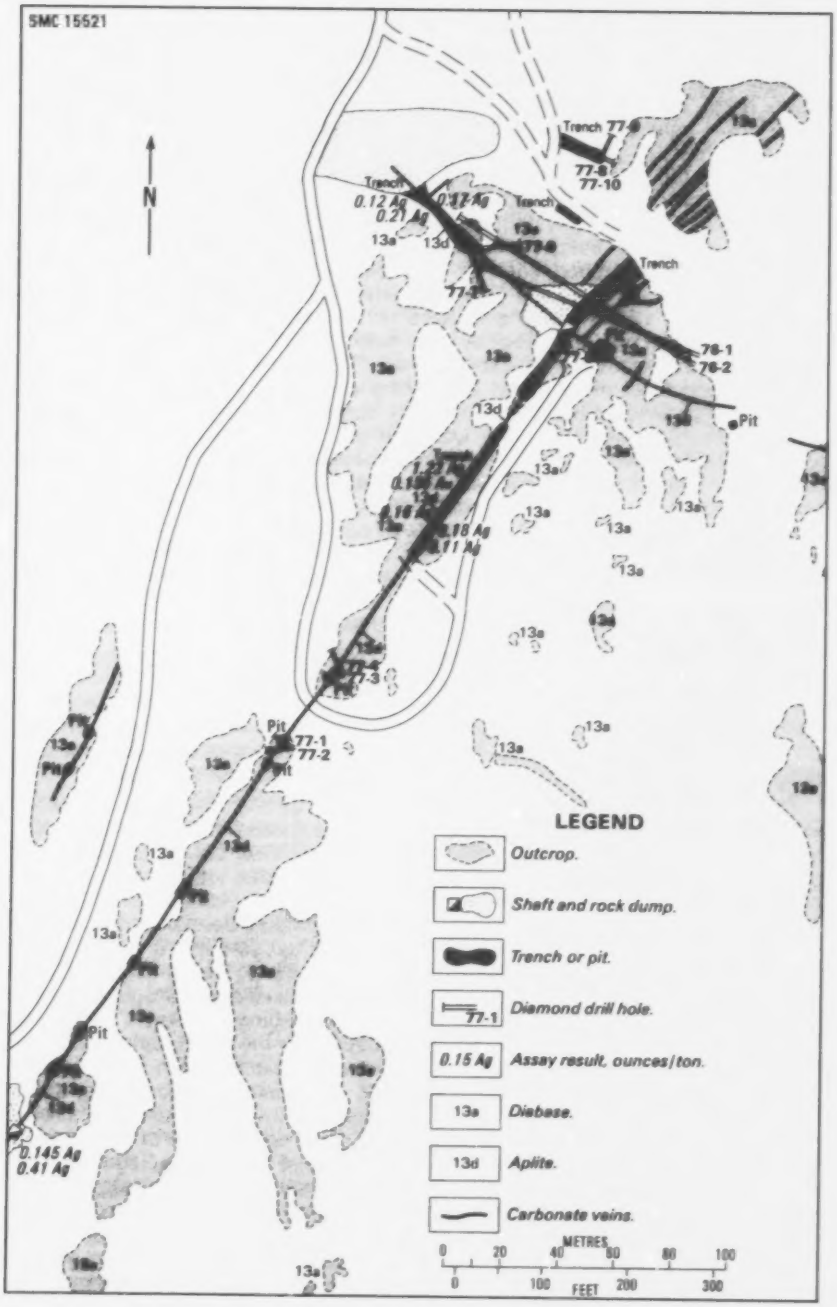

Figure 17. *Northern Silver Fox Resources Incorporated (Silver Jackpot Deposit) (36). Geology has been taken from the assessment files, Resident Geologists Files, Ontario Ministry of Northern Development and Mines, Kirkland Lake.*

PARAGON-HITCHCOCK MINES LIMITED DEPOSIT (37)

The Paragon-Hitchcock Mines Limited workings are found in the SE 1/4, N 1/2 of lot 10, concession I, Tudhope Township. The property is underlain by a dike of Nipissing Diabase. Moorhouse (1944) described surface showings of the mine and his description is as follows:

> "The Paragon-Hitchcock workings are located on claim M.R. 4,712 (Southeast quarter of the north half of lot 10, concession I) in Tudhope Township. A shaft has been sunk on the vein, which is found on a small outcrop of diabase.
>
> Trenching on the property has been done on three veins. The workings strike N86-60°W. They are now filled with water and drift, and little can be seen except a few narrow seams of calcite, a little malachite, and cobalt stain. There was no cobalt or silver mineralization seen on the dump. Several specimens of pink aplite containing hematite and crystallized chalcopyrite were observed. Some carbonate and red aplite associated with bornite and chalcopyrite were also noted."

A prospectus issued by the company in 1927 is on file in the Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake. In 1912, a shaft was started and sunk to a depth of 70 feet. In 1918, the company deepened the shaft to 162 feet and completed 260 feet of drifting on the 100-foot level where a 6-inch wide aplite vein and a 2-inch wide calcite vein were followed. The shaft was extended to 200 feet in 1919 and a level was started at this point where the combined aplite and calcite vein was 14 inches thick. In 1927, the shaft was completed to a depth of 338 feet with a level at the 330-foot level where the aplite and calcite vein was seen to be 18 inches thick. The company also commenced rebuilding the mill site and overhauling the plant.

No further information on this property has been found. This property is currently owned by B.M. Welsh who has four patented claims (MR 4747 to MR 4749; MR 4712) in the N 1/2 of lot 10, concession I.

PARAMOUNT COPPER (38)

Moorhouse (1944) has described this copper showing in detail. His description is as follows:

> "The Paramount Syndicate controls a group of 5 claims in Tudhope Township, M.R. 6,195 (southwest quarter of the south half of lot 12, concession V), M.R. 9648, 6196, 6197, and 6198 (north half of lot 12, concession IV).
>
> During the past two summers the property has been under lease to three different interests, who intended working the copper vein, which is located in the Nipissing diabase. It strikes N80°E and dips vertically or steeply south.
>
> The vein itself ranges from 1 to 10 inches in width but averages about 4 inches. It is exposed by 2 trenches. One is 50 feet long; the other, 125 feet to the west, about 330 feet long. In the first a little cobalt bloom, bornite, and copper stain occur in a vein filling of carbonate associated with streaks of aplite. In the second, the vein material occurs in two sections. The eastern 160 feet of trenching has a gangue composed chiefly of carbonate mineralized with bornite, chalcopyrite, and secondary malachite, covellite, chalcocite, etc. The vein material may be banded with zones of coarse carbonate on each side of the mineralization. In the western 170 feet of the trenching, the mineralization is chiefly quartz and chalcopyrite, although some carbonate may occur on the walls of the vein. Invariably a dike of pink (albitic) aplite occupies the hanging wall. This dikelet, which is half an inch to 5 inches wide, becomes coarser at the west end. Its contact with the diabase appears quite sharp, though the former is much altered near the vein. Mineralization may occur in the aplite. A little native silver was seen in one specimen, and values in gold are reported. Picked bornite ore is said to carry as much as 23 percent copper.
>
> About 22 chains north of the copper prospect, a shaft was sunk on two veins trending N75-45°W, and mineralized with an unidentified pyrite-like, cobalt-bearing mineral, chalcopyrite, galena, quartz, and calcite. The writer was

informed also that a vein carrying considerable quantities of smaltite was recently discovered on the property."

PARKER PROPERTY (39)

The Parker property is patented land in the SW 1/4, S 1/2 of lot 7, concession IV, Dack Township. The present owner of this land is not known. The showing is at Sunday Creek Falls on the Englehart River and the rock exposed is a massive mafic flow overlain by a 180 m thickness of ultramafic flows.

The base of the sequence is massive carbonatized peridotite and the top of the sequence is a highly sheared talc-carbonate schist. Moorhouse (1944) described the exploration on this property as follows:

"The Parker claim is located in the south half of lot 7, concession IV, Dack Township. The workings are found at Sunday Creek falls on the Englehart river. The chief working is a 100-foot shaft, sunk on the west side of the falls by Magloire Deroche for the owners of the claim. The shaft was sunk in a schistose zone in the greenstone.

An interesting zone is exposed on a water-worn outcrop in the middle of the falls. The rocks exposed are heavily sheared lavas (possibly produced by a northeast-trending fault) and coarse, massive, recrystallized greenstone. The latter is cut by two narrow lamprophyre dikes. A zone in the coarse rock, 80 feet by 50 feet, has been so altered that it weathers a chocolate brown. In thin section it proves to be a coarse gabbroic rock, which is almost entirely replaced by well-crystallized albite. This mass of rock is cut by quartz veinlets striking N.5°W. and dipping 55°E. or less. The veins have a maximum width of 3 inches and are bordered by rims of albite, which grade into the albitized greenstones. They are composed of quartz and brown-weathering carbonate and are mineralized with cube pyrite. Grab samples taken by H. Weeks are said to have yielded 0.8 pennyweights of gold from well-mineralized vein material, 0.4 pennyweights from mineralized albite, and a trace from albitized greenstone. A small body of similar material outcrops on the east side of the falls."

PETROMET RESOURCES LIMITED (40)

Petromet Resources Limited currently owns 23 claims in four groups in Bryce Township. The eastern group of claims (L 579229 to L 579232; L 579236 to L 579237) consists of six claims in the NW 1/4, NE 1/4, N 1/2 of lot 5, concession IV; NW 1/4, NE 1/4, N 1/2 of lot 6, concession IV, and the SW 1/4, SE 1/4, S 1/2 of lot 6, concession V, Bryce Township. This group is underlain by the southeastern corner of the Britcanna Porphyry, minor interbedded tuff and lapilli-tuff-tuff, and pillowed flows and clast-supported conglomerate of the Gowganda Formation. Parts of this group of claims have been owned by Britcanna Gold Mines Limited and Consolidated Imperial Minerals Limited. The main showing of the Britcanna Prospect is west of these claims and there has not been any significant exploration recorded on this ground. Consolidated Imperial Minerals Limited undertook an electromagnetic survey in 1972 on their property which included this claim group (Assessment Files Research Office, Ontario Geological Survey, Toronto).

The central group of claims consists of 11 claims (L 579238 to L 579241; L 585682 to L 585683; L 579218 to L 579221 and L 579215) in the S 1/2 of lot 8, concession IV; S 1/2 of lot 9, concession IV; and the NW 1/4, NE 1/4, SE 1/4, S 1/2 of lot 10, concession IV, Bryce Township. There is very little outcrop in this area and the ground is interpreted to be underlain by tuff to tuff-breccia. In 1962, Edmund Briscoe completed two diamond-drill holes for a total length of 205.5 feet in the NE 1/4, S 1/2 of lot 9, concession IV and the NW 1/4, S 1/2 of lot 8, concession IV, Bryce Township (Assessment Files Research Office, Ontario Geological Survey, Toronto). He also sunk in 1975, a 260-foot long diamond-drill hole in the NW 1/4, S 1/2 of lot 10, concession IV, Bryce Township. This particular claim had a geological survey completed in 1967 by Trihope Mining and Explora-

tion Limited (Assessment Files Research Office, Ontario Geological Survey, Toronto).

The southwest group of claims held by Petromet Resources Limited consists of four claims (L 579222 to L 579225) northwest of Heather Lake in the NW 1/4, N 1/2 of lot 11, concession III and the NE 1/4, NW 1/4, SW 1/4, N 1/2 of lot 12, concession III, Bryce Township. The claims are underlain by the quartz-feldspar sill which has been interpreted to be a synvolcanic intrusive. The only work that has been recorded on this group is by Raylloyd Mines and Explorations Limited who had an airborne magnetic and electromagnetic survey flown over the area in 1971. This survey did not delineate any electromagnetic or magnetic anomalies.

The northwest group consists of two claims (L 579216 to L 579217) north of Honeymoon Lake in the NW 1/4, SW 1/4, N 1/2 of lot 12, concession IV, Bryce Township. The claims are underlain by massive flows in fault contact with intermediate to felsic pyroclastic rocks. The claims have been examined by Trihope Mining and Exploration Limited as part of a large block of claims and magnetic, electromagnetic, and geologic surveys were done in 1967. The Rip Van Winkel Syndicate examined the contact zone between the mafic and intermediate metavolcanics in 1975 (Assessment Files Research Office, Ontario Geological Survey, Toronto).

RENÉ PICHÉ (41)

René Piché owns two patented claims (T 23823; T 23827) on the NE 1/4, S 1/2 of lot 12, concession V and the NW 1/4, N 1/2 of lot 11, concession V, Bryce Township. These two claims are part of the original Palmer-Vaughan Property and the description is found under the Touzin claims (Touzin (52)).

LOUIS RAMP (42)

Louis Ramp currently owns the patented claim MR 31103 found in the SW 1/4, N 1/2 of lot 9, concession I, Tudhope Township. Except for the southeastern corner, the claim is underlain by a Nipissing Diabase dike. The southeast corner has highly sheared mafic metavolcanics and a small intrusive body of diorite within it.

The claim, at present owned by Louis Ramp, has been referred to as the St. Lawrence claim and, in 1917, had $22,000 worth of work done on it in the form of two pits sunk on a 2- inch wide vein containing cobalt and silver (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake) Mr. F. Quesnel sold the St. Lawrence claim to Mr. Ramp in 1956. At this time there were two deep pits and some cleaned out trenches on the property. In 1962, two diamond-drill holes were put down in the diabase for a total of length of 205 feet (Assessment Files Research Office, Ontario Geological Survey, Toronto). Chalcopyrite was found in a 1.2- inch thick chloritic shear zone and in a 2.4- inch wide carbonate vein.

RIP VAN WINKEL SYNDICATE [1975] (43)

The Rip Van Winkel Syndicate formerly held 13 unpatented claims in the SW 1/4, N 1/2 and the S 1/2 of lot 1, concession IV; the NE 1/4, SE 1/4, SW 1/4 ,S 1/2 of lot 2, concession IV; the NE 1/4, NW 1/4, N 1/2 of lot 2, concession III, the NE 1/4, NW 1/4, N 1/2 of lot 3, concession III, and the SE 1/4, S 1/2 of lot 3, concession IV, Tudhope Township. The claims are underlain by northeast-trending intermediate to felsic tuffs, lapilli-tuffs, tuff-breccia and minor pyroclastic breccia which has been intruded by thin feldspar porphyry and quartz porphyry dikes. The northeastern corner of the claims is underlain by pillowed mafic flows.

In 1967, Trihope Mining and Exploration Limited completed detailed magnetic, electromagnetic, and geological surveys over a large area which included this claim group currently owned by the Rip Van Winkel Syndicate. During 1972 and 1973, Consolidated Boeing Holdings and Resources carried out some electromagnetic survey checks and a minor geochemical survey on a part of the ground held by the Rip Van Winkel Syndicate and put down two diamond-drill holes for 437 feet (Assessment Files Research Office, Ontario Geological Survey, Toronto). In 1975,

The Rip Van Winkel Syndicate inspected known gold showings and did some minor VLF electromagnetic check surveys.

SAM ROSENBLAT [1963] (44)

Sam Rosenblat formerly held two claims in the NW 1/4, NE 1/4, N 1/2 of lot 12, concession VI, Tudhope Township. The claims are underlain by Gowganda Formation sediments which have been intruded by a sill of Nipissing Diabase. The sediments, not exposed in outcrop, are interpreted to be predominantly thickly laminated argillites with interbedded conglomerate.

Two diamond-drill holes were sunk for a total length of 900 feet in 1962. They were collared in the Nipissing Diabase and bottomed in the Gowganda Formation sediments. Calcite veins and veinlets were seen in the sediments and they contained specular hematite with minor chalcopyrite (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake).

ERNEST SAGER PROPERTY (45)

Ernest Sager owns one patented claim (T 18396) in the NW 1/4, N 1/2 of lot 6, concession VI and two leased claims (T 54636 to T 54637) on the NE 1/4, NW 1/4, S 1/2 of lot 10, concession II, Bryce Township. The southern two claims are underlain by Gowganda Formation conglomerate, red thickly laminated argillite, arenite, and wacke and a small inlier of lapilli-tuff and pyroclastic breccia. In 1962, a 5 foot by 7 foot shaft was extended from 23 feet to 27 feet in the red argillite on claim T 54636 (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). There are no results reported from this work.

SAUVÉ PROSPECT (GEORGE WELSH PROPERTY) (46)

George Welsh currently owns two claims in the NW 1/4, NE 1/4, N 1/2 of lot 10, concession VI, Tudhope Township. These claims, referred to as the Sauvé Prospect (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake) are underlain by conglomerate and wacke of the Gowganda Formation which has been intruded by a dike of Nipissing Diabase which strikes N70°E.

The original discovery of copper mineralization was made around 1903, and trenching and prospecting were carried out between 1903 and 1910. Chalcopyrite and abundant specular hematite occurs in calcite veins found along the contact of the diatbase with the sediments and in calcite veins that cross-cut the dike.

The claims were restaked by Chavigny Gold Mines Limited. In 1948, the company carried out a magnetic survey, inspected the original trenches, and sunk a 600-foot long diamond-drill hole through the diabase dike (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). Calcite veins containing chalcopyrite and specular hematite were intersected. The claims were allowed to lapse.

They were restaked by William Inch who cleaned and deepened the original trenches in 1953 and 1954. A trench 105 feet long exposed the southern contact of the diatbase and revealed a 5-foot wide fracture zone which contains pink calcite with vein breccia of diabase that ranges up to 18 inches thick. Pitchblende is found occurring with chlorite in the vein breccia. A selected sample of the radioactive material contained 1.56 percent U_3O_8 equivalent (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). Chalcopyrite, minor bornite and pyrite, and abundant specular hematite is also found in the fracture zone. The chalcopyrite occurs in rounded and irregular shaped massive zones up to 3 inches wide. Stan Welsh sunk a 213-foot long diamond-drill hole through the diabase in 1955.

In 1976, George Welsh tested the Nipissing Diabase-Gowganda Formation contact with five trenches (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake).

THELMA SEWELL PROPERTY (47)

Thelma Sewell currently owns a single patented claim (T 25720) in the SW 1/4, S 1/2 of lot 10, concession V, Bryce Township. This claim straddles the contact between the mafic and intermediate metavolcanics. This claim was formerly owned by Frank Westcott and is described by Moorhouse (1944) as follows:

> "Claim T. 19,252 (southwest quarter of the south half of lot 10, concession V), Bryce Township, is held by Frank Westcott, of Elk Lake.
>
> This claim is underlain by pillow lavas and other basic volcanics and cut by porphyry and lamprophyre dikes. Mr. Westcott states that a channel sample from a wide dike of porphyry cut by quartz stringers gave 0.19 ounces over a width of 18 feet. The writer did not have the opportunity of seeing this zone."

SHELL CANADA RESOURCES LIMITED PROPERTY (48)

Shell Canada Resources Limited owns three unpatented claims (L 522548 to L 522550) in the SW 1/4, SE 1/4, N 1/2 of lot 5, concession IV and the NW 1/4, S 1/2 of lot 5, concession IV, Bryce Township. The overburden is thick in this area and the claims are interpreted to be underlain by Gowganda Formation sediments which have been cut by a 300 m wide northeast-trending Nipissing Diabase dike.

SYRACUSE MINING COMPANY [1909] (49)

Syracuse Mining Company formerly held two claims in the NE 1/4, N 1/2 of lot 10, concession V, and the SE 1/4, S 1/2 of lot 10, concession VI, Tudhope Township. The claims are underlain by massive, medium-grained Nipissing Diabase. In 1909, a map of the carbonate vein system was produced showing a single northwest-trending vein with minor cross veins associated with it (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake).

TERRY GOLD EXPLORATION INCORPORATED PROPERTY (50)

Terry Gold Exploration Incorporated currently holds six contiguous claims in Bryce, Robillard, and Truax Townships (L 151774 to L 151777; L 537926 to L 537927). The claims are in the SE 1/4, S 1/2 of lot 1, concession I, Truax Township; SE 1/4, SW 1/4, S 1/2 of lot 12, concession I, Robillard Township; SW 1/4, S 1/2 of lot 11, concession I, Robillard Township; and the NE 1/4, NW 1/4, N 1/2 of lot 12, concession VI, Bryce Township. The claims are underlain by foliated tonalite of the Round Lake Batholith. The tonalite has been reported to have been cut by a pebble-bearing lamprophyre and quartz veins (Assessment Files Research Office, Ontario Geological Survey, Toronto).

The two claims in Bryce Township were originally known as the Paquette claims and have been described by Moorhouse (1944) as follows:

> "An unusual occurrence of gold values is reported from the Paquette claims, T. 24,428 and 24,429 (northwest and northeast quarters of the north half of lot 12, concession VI) in Bryce Township. These claims are underlain by granodiorite, which is at least half a mile distant from the nearest greenstone. The granodiorite near one of the veins is cut by a lamprophyre dike carrying abundant rounded fragments of granodiorite, pegmatite, greenstone, and gneiss.
>
> The mineralization occurs in altered joints in the granodiorite ("granite"), forming zones as much as 5 feet wide. They strike N. 20°-40°E. and dip 70°S.E. Slickensides are present on the walls. The gangue consists of quartz, carbonate, sericite, chlorite, and albite. The mineralization, which is chalcopyrite, pyrite, and a little sphalerite, is largely confined to a single seam in the jointed

zone. The quartz may be as wide as 1 foot, but is usually much narrower. The granodiorite near the veins is sericitized, carbonatized, and silicified.

J.T. Mearow and J.A. Hough, of Charlton, report that unusually high gold values have been obtained from grab samples. The mineralized streaks appear to be too narrow to be of more than scientific interest."

In 1980, the former Paquette claims were examined for the Terry Gold Exploration Incorporated and grab samples were obtained from quartz-bearing pyritiferous joints. The best assay result was 0.05 ounce gold per ton (Assessment Files Research Office, Ontario Geological Survey, Toronto).

A. TOUZIN (PALMER-VAUGHAN PROPERTY) [1954] (51)

A. Touzin formerly held ten claims in the following locations: NE 1/4, NW 1/4, SW 1/4, N 1/2 of lot 10, concession V; NE 1/4 , SE 1/4, SW 1/4, N 1/2 of lot 11, concession V; N 1/2 of lot 12, concession V, Bryce Township. The claims owned by A. Touzin lie wholly within the former Palmer-Vaughan Property for which Moorhouse (1944) gave a complete description:

"The Palmer-Vaughan group comprises a block of 12 claims in concession V in the northwestern part of Bryce Township, T. 24,021, 23,826, and 25,002 (northeast, southwest, and southeast quarters of the north half of lot 12); 23,823 (northeast quarter of the south half of lot 12); 23,827, 23,709, 25,003, and 25,231 (north half of lot 11); 23,858, 23,859, 23,955, and 24,245 (north half of lot 10). The group includes claims held by Peter Vaughan, H.A. Palmer, J.A. Lalonde, and C. Haacke, of Charlton and vicinity.

The geology of the claims is relatively simple. Outcrops of pillow lavas and coarse diabasic and gabbroic flows predominate. These have been cut by two dikes of diabase, dikes and bodies of aplitic hornblende syenite, "peanut porphyry", rhyolite, quartz-feldspar porphyry, and lamprophyre.

The lavas, shearing, and many of the dikes strike north of east. North-south and northwest by north joints, locally in sufficient number to constitute shearing, are also abundant and in some cases are filled by lamprophyres and related dikes.

Some values have been obtained from a persistent shear zone that crosses the claims from west to east, striking N. 50°-75°E and dipping south. Most of the work has been done on claim T. 23,823. Where the break is exposed on this claim it strikes N. 66°E. and is quite narrow, the maximum width of the main stringer being 6 inches. From this, subsidiary joints and shear zones branch off to north and south. The vein occurs in pillow lavas and is associated with a dike of porphyritic andesite ("peanut porphyry"), which it appears to cut. Lamprophyre dikes, in part fine-grained phases of the andesite, also outcrop near the vein.

The mineralization is dominantly vitreous to greasy quartz, with some feldspar and carbonate, mineralized with fine-grained crystalline pyrite. The pyrite is found in the wall rock as well, though it is rarely without thin lenses or stringers of watery black quartz in the vicinity. Native gold is reported from the vein by Peter Vaughan, and chalcopyrite is said to be present. The vein has been sampled many times. Samples taken by B.W. Hartley, as reported by Mr. Palmer, gave values from traces to 1.05 ounces over 10 inches. About half of the 20 samples reported gave 0.57 ounces or more from widths of 3 to 10 inches. Higher assays are reported. Twelve diamond drill-holes were put down on the vein by the Auric Diamond Drilling Company for Britcana Mines. According to a report by J.J. Flanagan, 6 of the holes gave interesting values. Five carried 0.17 to 0.20 ounces over widths of 1 to 3 feet, and a sixth gave 0.33 ounces over 12 inches. A sample of quartz containing fine-grained pyrite submitted to the Provincial Assay Office by the writer yielded 0.05 ounces.

About 150 feet north of this break, trenching has been done on a series of pyritized, carbonatized, chloritic shear zones, 3 to 7 feet wide, striking N.45°-53°E. and carrying quartz stringers 2 to 12 inches wide. The shear zone

is exposed for 130 feet in an outcrop of massive, jointed medium-grained greenstone and reappears 400 feet to the east.

To the east on the main break, interesting mineralization is found at several points on other claims. Near the east border of claim T. 25,003 a carbonatized shear zone 2 to 3 feet wide cut by 10 inches of quartz is mineralized with pyrite and sphalerite. Carbonate cuts the pyrite and sphalerite. A sample containing sphalerite submitted to the Provincial Assay Office gave 0.03 ounces of gold per ton. Trenches expose the shear zone intermittently for 450 feet to the east. It has a maximum width of 11 feet and is bordered by massive diorite or gabbroic greenstones and intruded by an aplitic hornblende syenite dike and, for part of its length, by a porphyritic andesite dike ("peanut porphyry"). For about 30 chains east of these workings the shear zone is tight and unmineralized. In the eastern part of claim T. 23,858 and on claim T. 23,859, however, mineralization reappears. Here, a chloritic shear zone 2 to 4 feet wide, carrying as much as 10 inches of greyish-blue or black quartz containing carbonate is mineralized with pyrite, local sphalerite, and copper stain. A sample containing sphalerite taken by the writer gave no gold on assay by the Provincial Assay Office. This zone in ellipsoidal and coarse greenstones is bordered on the south by a porphyritic andesite dike 5 feet wide and is exposed for a length of 80 feet in one outcrop and for 80 feet in a second 120 feet to the east.

The remainder of the workings are distributed at intervals over a length of 500 feet, 9 chains farther east. In the eastern 100 feet a shear zone 4 to 7 feet wide is replaced by cherty quartz as much as 2 feet in width, which is itself cut by later quartz. Pyrite occurs in the shear zone and in chloritic quartz. In one of the pits a considerable amount of galena and a little pyrite is present. A sample taken by the author from the hanging wall of this pit carried pyrite, coarse quartz, ankerite, and chlorite and gave 0.10 ounces in gold on assay by the Provincial Assay Office. Assays reported by Mr. Vaughan are low. About 125 feet west of this pit, the break is offset along a shear zone which is occupied by lamprophyre and porphyry. Vein formation appears to be later than the offsetting. A little prospecting has been done on parallel shear zones to the north."

A report on the Touzin claims, dated October 1953 (Assessment Files, Resident Geologist's Office, Ontario Ministry of Natural Resources, Kirkland Lake) mentioned two X-Ray diamond-drill holes, but gives no core logs or assay results.

TOWN-WOOLINGS-MULHOLLAND (52)

[Town is spelt "Town" on the Map 2501, in back pocket, and that spelling is retained here, but the usual spelling is Towne.]

Moorhouse (1944) stated:

"A considerable amount of work was done by J.J. Towne and the late T.S. Woollings, of Englehart, on veteran lots in Bryce Township belonging to a Toronto group in consideration of one-third interest in the claims. These lots include the south half of lot 11, concession V, and the south halves of lots 8 and 9, concession VI.

The claims are located on portions of the Palmer - Vaughan Estival break. On the lot in concession V only a short section of the vein enters the claim. It is here offset 11 feet to the south by a fault striking N. 50°W. West of the fault the shear zone has a maximum width of 2 feet and carries well-fractured, watery-looking quartz and cube pyrite. There is abundant rust derived from carbonate. East of the fault as much as 2 feet of quartz containing fine-grained aplite is exposed. It is divided into two sections by 1 foot of chlorite schist. The quartz and aplite have been brecciated. There is little mineralization. Lamprophyres and related rocks are abundant in the vicinity of the vein.

The lots in concession VI are crossed by the eastward continuation of the break beyond the Estival workings. Widths of quartz are 1 foot or less except

in one short section of quartz mineralized with coarse pyrite and chalcopyrite. The break has been followed by scattered trenches for about 2,000 feet."

EDGAR VENNE [1971] (53)

Edgar Venne formerly held three claims in the vicinity of the lake 2 km east of Hope Lake in Tudhope Township. The claims are underlain by pillowed, mafic metavolcanics in contact with the granodiorite of the Hope Lake Stock. A quartz vein trending northeast from the eastern arm of the lake is reported to contain gold mineralization (Orien Venne, Prospector, personal communication, 1980).

The ground was originally staked by E.W. Karp who reported the occurrence of copper mineralization. Several shallow pits were excavated, but significant mineralization was not found (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). In 1957, E.W. Karp sunk two diamond-drill holes for a length of 94 feet through the metavolcanics and aplite dikes. The ground was restaked by Edgar Venne who had three claims on the SW 1/4, N 1/2 of lot 7, concession III; NW 1/4, S 1/2 of lot 7, concession III and the NE 1/4, S 1/2 of lot 8, concession III, Tudhope Township. In 1969, a single 50-foot long diamond-drill hole was drilled to intersect the quartz vein. The drilling and additional trenching across the quartz vein was carried out in 1971, but failed to discover significant mineralization.

FRED WALSH (54)

Fred Walsh formerly owned two claims in the NW 1/4, NE 1/4, N 1/2 of lot 10, concession V, Tudhope Township. The claims are underlain by a sill of Nipissing Diabase. Silver and cobalt mineralization have been reported on the NW 1/4 claim, known as the Cummings claim. A 2.5 inch wide carbonate vein bearing N21°E has been tested with a pit 10 feet by 12 feet and 23 feet deep. Another nearby vein, bearing S61°E, is reported to contain silver, nicolite, smaltite, chalcopyrite, and bornite (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake). No assay values are available for these mineralized veins.

Fred Walsh acquired the Cummings claim and the one to the east and put down three diamond-drill holes for a length of 81 feet through the N 21 E trending vein on the Cummings claim. The date of the drilling is not known, but the drill logs are date stamped 1957 (Assessment Files, Resident Geologist's Office, Ontario Ministry of Northern Development and Mines, Kirkland Lake).

WEEKS-SIMPKIN PROPERTY (55)

Moorhouse (1944) described the property:

"The Weeks-Simpkin Property is found on a patented lot in the S 1/2 of Lot 5 Concession V of Dack Township.

A discovery made by H. Weeks, of Englehart, is located on the farm of A.P. Simpkin in the south half of lot 5, concession V, Dack Township. The vicinity of the find is entirely covered by heavy clay overburden, so that little can be said regarding the geology. Pillow lavas outcrop for some distance to the north, west, and south.

As shown on the sketch map (Fig. 8), the main trench is about 40 feet long. At the south end an albitized greenstone, similar to that at the Parker property, outcrops. Three feet north of the south end of the trench there is a strongly fractured quartz zone nearly 4 feet wide, which carries dark streaks of grey, sooty molybdenite and brown-weathering carbonate in the fractures. In all there is 2 feet 7 inches of quartz and 1 foot of quartz with schist inclusions dividing the vein into two parts. At the bottom of the pit, at a depth of 8 feet, the vein widens to 6 feet 9 inches but includes a 3-foot wedge of greenish carbonate "porphyry." The vein is exposed for 20 feet to the east, where it disappears under drift. It forms the south wall of a 9-foot dike of "porphyry" composed of carbonate carrying chlorite and sericite. It appears to be a

carbonatized dike of a lamprophyric type. Lenticular veins also cut the north wall of the dike. Two or three feet north of the porphyry a 3-foot width of brecciated chloritic greenstone cemented by ankerite is exposed for 20 feet east of the trench. Irregular splashes and veinlets of quartz are present. Four or five feet south of the north end a 6-inch vein of quartz, carbonate, and pyrite cuts the greenstone. Twenty to thirty feet east of the main trench platy schist striking N.67°W. and dipping 45°S. is exposed in a creek bed. It is cut by stringers of quartz and feldspar and seems to bear no relationship to the structure carrying the dike and quartz vein.

Ten diamond-drill holes, totalling 1,600 feet, were drilled by Erie Canadian Mines. In all but two of the holes no results of interest were obtained. In hole No. 1, however, 1.2 to 3.6 pennyweights of gold over a nearly continuous section 20 feet long was reported; and in hole No. 2, 9.20 pennyweights of gold over 1 foot and 1.2 to 4.0 pennyweights over 5 feet was said to have been obtained. The longer sections in both cases came from brecciated greenstone cut by well-mineralized stringers of quartz and some of feldspar. This may represent the brecciated zone exposed on surface. There is some doubt whether all the holes were located so as to intersect the mineralized zone.

Surface sampling is said to have yielded rather low assays for the most part. Half a mile to the southwest, just south of the Englehart river, flat-dipping quartz-carbonate stringers containing fine-grained pyrite cut an albitized, chloritic greenstone, which resembles the rock at the south end of the Weeks-Simpkin property. Sampling of this by D. Campbell is said to have yielded only traces of gold.

About twenty years ago M. Deroche and W. Scott drove two short tunnels into drift and platy schist in the side of a creek valley about 20 chains west of the main pit."

BEATRICE WELSH PROPERTY (56)

Beatrice Welsh owns six leased claims (MR 22045 to MR 22047; MR 23432; MR 25357; MR 27245) in the SE 1/4, S 1/2 of lot 7, concession I; SW 1/4, SE 1/4, N 1/2 of lot 8, concession I; SE 1/4, NE 1/4, NW 1/4, N 1/2 of lot 9, concession I, Tudhope Township. These claims are underlain by strongly schistose, metamorphosed interbedded mafic and intermediate metavolcanics that have been intruded by a wide Nipissing Diabase dike. The degree of metamorphism of the metavolcanics indicates that the contact of them with the Round Lake Batholith is not too far below the present ground surface.

In 1958 and 1959, ten diamond-drill holes were sunk for an accumulated length of 1303 feet (Assessment Files Research Office, Ontario Geological Survey, Toronto). The holes sunk in both the diabase and metavolcanics encountered many quartz veins and shear zones. No assays are reported from this drilling.

GEORGE WHITTON PROPERTY (57)

George Whitton owns a single patented claim (T 19436) in the NE 1/4, N 1/2 of lot 6, concession VI, Bryce Township. The claim is underlain by massive, medium-grained mafic flows. This single claim is part of a group of four claims originally owned by Mr. Whitton which have already been described under the title "Bruce Holmes Property. (Whitton Prospect) (18)".

E. WIELE PROPERTY (58)

E. Wiele owns one patented claim (MR 2094) in the NW 1/4, S 1/2 of lot 12, concession V, Tudhope Township. The claim is underlain by massive medium-grained Nipissing Diabase. No assessment work information is available for this claim.

MARJORIE WIGSTON PROPERTY (59)

Marjorie Wigston owns one patented claim (T 24080) in the SW 1/4, N 1/2 of lot 10, concession II, Bryce Township. The claim is underlain by unsorted, interbedded, carbonatized tuff, lapilli-tuff, and tuff-breccia which has been intruded by a thin east-trending Nipissing Diabase dike. The southeastern corner of the claim has been overlain by Gowganda Formation matrix-supported conglomerate. There has been no assessment work recorded for this claim.

R. WILLIAMS PROPERTY (60)

R. Williams currently owns two unpatented claims (L 571344 - L 571345) in the SW 1/4, SE 1/4, N 1/2 of lot 11, concession III, Robillard Township. The claims are underlain by foliated tonalite of the Round Lake Batholith. In 1974, Norman MacDonald put down a 145-foot long diamond-drill hole through the tonalite and a 9.5-foot thick quartz vein containing pyrite, chalcopyrite, and chlorite. The quartz vein contained a trace of gold and 0.45 ounce silver per ton (Assessment Files Research Office, Ontario Geological Survey, Toronto).

Suggestions to Prospectors

The potential for economic gold mineralization remains high within the map area. All rusty shear zones found within the metavolcanics should be examined. The "Palmer-Vaughan-Estival Break" found trending northeast in the lower part of the Catharine Group in Bryce and Tudhope Townships should be examined in detail because numerous good gold showings occur along it. Any carbonatized shear zones or shear zones with an accompanying porphyry dike have high potential for gold mineralization. Of particular note, is the sheared, carbonatized metavolcanics of the Skead Group in the vicinity of Heather Lake. As well as being highly schistosed and altered, these rocks contain many porphyry bodies. The fuchsite-bearing, carbonatized shear zones in Dack Township contain gold. In addition to the two known properties, the rocks exposed in the Englehart River north of Charlton should be examined because there is little evidence of intensive prospecting there.

There is less potential for silver within the area. Even though many old trenches and pits within the Nipissing Diabase contain traces of silver, significant quantities were not found to date. The old Silver Jackpot Mine, now owned by Northern Silver Fox Resources Incorporated (36) has reported high silver values so the potential for discovering economic silver mineralization in the author's map area remains.

Copper is found in bornite-chalcopyrite bearing carbonate veins within the Nipissing Diabase sill. The Ethel Copper Mine in James Township is a past producer (Mackean 1968) and similar grade and tonnage may be found in Tudhope Township. The vein system 800 m east of the Silver Jackpot Shaft is of particular interest.

The coarse-grained pyroclastic rocks found within the Skead Group, especially in the vicinity of Heather Lake, are considered favourable host rocks for the deposition of massive sulphides (Sangster 1972). Massive sulphide mineralization has not been detected in the area. Even though an airborne electromagnetic survey carried out in 1968 failed to indicate any anomalies, the presence of massive sulphide deposits should not be ruled out. Pyritized tuff and massive pyrite have been reported in diamond drill logs (Assessment Files Research Office, Ontario Geological Survey, Toronto) for those diamond-drill holes sunk on the Libby Prospect. [The reader should consult the detailed account given for Gossan Resources Limited (Libby Prospect) (15) and the property listings given on Map 2501, in the back pocket.] These pyritiferous horizons have a strong electromagnetic response associated with them.

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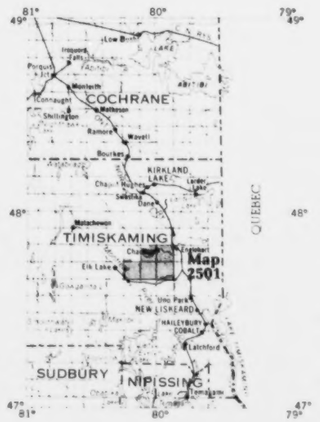
ONTARIO GEOLOGICAL SURVEY REPORT 250

Map 2501 (coloured)—Hill Lake Area District of Timiskaming

Scale 1:31 680 of 1 inch to 1/2 mile

Ontario Geological Survey
Map 2501
Hill Lake



Scale 1 inch to 50 miles

NTS Reference 31M 12, 31M 13, 41P 9, 41P 16

SOURCES OF INFORMATION

Geology by G.W. Johns, Warren Hoyle, David Good and assistants, Ontario Geological Survey, 1980.

Geology is not tied to surveyed lines.

Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake.

Source Mineral Deposit Records, Assessment Files Research Office, Ontario Geological Survey, Toronto.

Aeromagnetic maps (GSC), 1493 G New Liskeard, 1494 G Englehart, 1505 G Elk Lake, 1506 G Charlton station. Scale 1 inch to 1 mile.

Moorhouse, W.W.
1941: Bryce-Robillard Area, District of Timiskaming, Ontario. Department of Mines Map 50j, Precambrian Geology Series. Scale 1 inch to ½ mile. Geology 1940.

Cartography by D.J. Laroche and assistants, Surveys and Mapping Branch, 1984.

Base maps derived from maps of the Forest Resources Inventory, Surveys and Mapping Branch.

Magnetic declination in the area was approximately 11°W, in 1980.

This project was funded by the Ontario Ministry of Northern Affairs through the Northern Ontario Geological Survey (NOGS) program.

Parts of this publication may be quoted if credit is given. It is recommended that reference to this map be made in the following form:

Johns, G.W., Hoyle, Warren and Good, David
1985: Hill Lake; Ontario Geological Survey Map 2501, Precambrian Geology series, scale 1 inch to ½ mile. Geology 1980.

PROPERTIES, MINERAL DEPOSITS

1. Bailey, Charles Property
2. Bailey, W.J. Property
3. Becker, J. Property
4. Briscoe, Edward (Briscoe-Bryce Deposit)
5. Briscoe, H.J. Property
6. Brown, P.A.R. Property
7. Charlton Group Properties
8. Copper Island Mining Company
9. Des Ormeaux-Miskimins-Chalut Group
10. Eplett, William Property
11. Fatima Mining Company Limited [1962]
12. Gereghty, G. (Britcanna Prospect)
13. Giles, G.
14. Gore, J.A. Property
15. Gossan Resources Limited (Libby Prospect)
16. Haacke, Clair Property
17. Hill, D.C. Property
18. Holmes, Bryce Property (Whitton Prospect)
19. Jutras, A. [1963]
20. Karp Property
21. Lavallée, Stan Property [1960]
22. Lynch, Harold Property
23. Macdonald, Norman Property
24. Malauf, M. Property
25. Marchese, Donna (Estival Property)
26. McCreary, N.C. Property
27. McGale, Jack Property
28. McNaughton, Bertha (Payne Property)
29. Mearow-McCombe [1939]
30. Menco Exploration Limited [1956]
31. Miller, Edward Property
32. Min-Ore Mines Limited [1959]
33. Morris, J. Property
34. Mowat, A. (Hillcrest Property)
35. Nielsen, Ellen Property
36. Northern Silver Fox Resources Incorporated (Silver Jackpot Deposit)
37. Paragon-Hitchcock Mines Limited Deposit
38. Paramount Copper
39. Parker Property
40. Petromet Resources Limited
41. Piche, René Property
42. Ramp, Louis Property
43. Rip Van Winkel Syndicate [1975]
44. Rosenblat, Sam [1963]
45. Sager, Ernest Property
46. Sauvé Prospect (George Welsh Property)
47. Sewell, Thelma Property
48. Shell Canada Resources Limited Property
49. Syracuse Mining Company [1909]
50. Terry Gold Exploration Incorporated Property
51. Touzin (Palmer-Vaughan Property) [1954]
52. Town-Woolings-Mullholland
53. Venne, Edgar [1971]
54. Walsh, Fred
55. Weeks-Simpkin Property
56. Welsh, Beatrice Property
57. Whitton, George Property
58. Wiele, E.
59. Wigston, Marjorie Property
60. Williams, R. Property

Information current to December 31, 1980. Former properties on ground now open for staking are only shown if exploration data is available. A date in square brackets indicates last year of exploration activity. For further information see report.

NOTE

The typographic name "Pike Lake" is not approved by the Ontario Geographic Names Board. It is used on this map as a reference point.

LEGEND

PHANEROZOIC

CENOZOIC[a]

QUATERNARY

PLEISTOCENE AND RECENT

Glacial, glaciofluvial, swamp, lake and stream deposits.

UNCONFORMITY

PRECAMBRIAN[b]

MIDDLE PRECAMBRIAN

MAFIC INTRUSIVE ROCKS

NIPISSING DIABASE

13 Unsubdivided
13a Diabase
13c Diabase chilled margins
13d Aplite, granophyre

INTRUSIVE CONTACT

HURONIAN SUPERGROUP

COBALT GROUP

LORRAIN FORMATION

12a Feldspathic arenite
12b Grit to pebble conglomerate
12c Breccia dike

CONFORMABLE CONTACT

GOWGANDA FORMATION

11 Unsubdivided
11a Conglomerate, matrix supported
11b Conglomerate, clast supported
11c Thickly laminated mudstone and wacke
11d Thickly laminated green-gray mudstone and shale
11e Feldspathic lithic arenite
11g Wacke

UNCONFORMITY

EARLY PRECAMBRIAN

UNMETAMORPHOSED MAFIC INTRUSIVE ROCKS

10a Diabase
10b Porphyritic diabase (feldspar phenocrysts)

INTRUSIVE CONTACT

MAFIC ALKALIC INTRUSIVE ROCKS

9a Lamprophyre
9b Pebble-bearing lamprophyre

INTRUSIVE CONTACT

FELSIC TO INTERMEDIATE INTRUSIVE ROCKS

8 Unsubdivided
8a Tonalite, trondhjemite
8b Granodiorite
8d Aplite
8f Cataclastic tonalite
8g Contaminated tonalite, diorite
8h Tonalite with mafic metavolcanic xenoliths
8j Mylonite

INTRUSIVE CONTACTS

METAMORPHOSED FELSIC TO INTERMEDIATE INTRUSIVE ROCKS

7 Unsubdivided
7a Quartz porphyry
7b Feldspar porphyry
7c Quartz-feldspar porphyry
7e Felsite
7f Carbonatized

INTRUSIVE CONTACT

METAMORPHOSED MAFIC INTRUSIVE ROCKS

6 Unsubdivided
6a Hypersthene diorite
6b Gabbro
6c Porphyritic gabbro (feldspar phenocrysts)
6d Hornblende diorite
6e Diabase

INTRUSIVE CONTACT

CHARLTON ULTRAMAFIC INTRUSION

5a Wehrlite
5c Pyroxenite
5d Leucocratic gabbronorite
5e Carbonatized
5f Serpentinized
5g Vanolitic mafic dike

INTRUSIVE CONTACT

METASEDIMENTS

CHEMICAL METASEDIMENTS[c]

4a Chert and very fine grained felsic tuff

METAVOLCANICS

ULTRAMAFIC METAVOLCANICS[c]

3 Unsubdivided
3a Massive peridotite
3c Spinifex texture
3d Talc-carbonate schist
3e Chlorite schist
3f Tremolite
3g Carbonatized

INTERMEDIATE TO FELSIC METAVOLCANICS[c]

2 Unsubdivided
2a Massive lava
2b Porphyritic lava (feldspar and quartz phenocrysts)
2c Tuff
2d Lapilli-tuff
2e Lapillistone
2f Tuff breccia
2g Pyroclastic breccia
2h Carbonatized
2j Amphibolitized, hybridized

MAFIC METAVOLCANICS[c]

1 Unsubdivided
1a Massive fine-grained lava
1b Massive medium-grained lava
1c Pillowed lava
1d Amygdaloidal lava
1e Variolitic lava
1g Black high iron mafic lava
1h Spinifex texture
1j Broken pillow breccia
1k Isolated pillow breccia
1m Flow breccia
1n Porphyritic flow (amphibole phenocrysts)
1o Amphibolite
1p Metamorphic layering
1q Carbonatized
1r Xenoliths of intermediate tuffaceous material
1s Epidotized mafic flows

Breccia

Ag	*Silver*
Au	*Gold*
cp	*Chalcopyrite*
Cu	*Copper*
fu	*Fuchsite*
hem	*Hematite*
qcv	*Quartz carbonate vein*
qv	*Quartz vein*
ra	*Radioactive minerals*
S	*Sulphide mineralization*

[a]*Unconsolidated deposits. Cenozoic deposits are represented by the lighter coloured and uncoloured parts of the map.*

SYMBOLS

Glacial striae. Glacial fluting or drumlin.

Esker.

Bedrock; (small outcrop, area of outcrop).

Bedding, horizontal.

Bedding, top unknown; (inclined, vertical).

Bedding, top indicated by arrow; (inclined, vertical, overturned).

Bedding, top (arrow) from grain gradation; (inclined, vertical, overturned).

Bedding, top (arrow) from cross bedding; (inclined, vertical, overturned).

Bedding, top (arrow) from relationship of cleavage and bedding; (inclined, overturned).

Lava flow; top (arrow) from pillows shape and packing. Lava flow; top in direction of arrow.

Schistosity; (horizontal, inclined, vertical).

Gneissosity; (horizontal, inclined, vertical).

Foliation; (horizontal, inclined, vertical).

Banding; (horizontal, inclined, vertical).

Lineation with plunge.

Geological boundary; (observed, position interpreted, deduced from geophysics).

1000 MA — *Magnetic contour value in gammas. Magnetic attraction.*

Fault; (observed, assumed). Spot indicates down throw side, arrows indicate horizontal movement.

Lineament.

Jointing; (horizontal, inclined, vertical).

Drag folds with plunge.

Anticline, syncline, with plunge.

DH — *Drill hole; (vertical, inclined, projected vertically, projected up dip). Overburden shown.*

Vein, vein network. Width in inches, feet or metres.

RA — *Radioactivity.*

Swamp.

Motor road. Provincial highway number encircled where applicable.

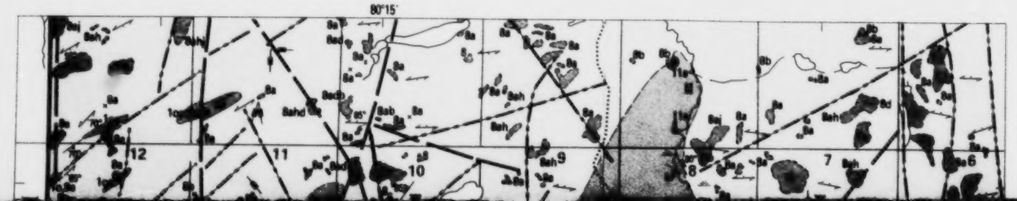
Other road.
Trail, portage, winter road.

International or Provincial boundary.

VI — *County, District, Regional or District Municipal Boundary, with mile post.*

VI — *Municipal Boundary, (City, Town, Improvement District, Incorporated Township), with milepost.*

VI — *Township, Indian Reserve, Meridian, Base Line, Provincial Park, with*



Ministry of Natural Resources
Ontario

Ontario Geological Survey

Map 2501

HILL LAKE

TIMISKAMING DISTRICT

Scale 1:31,680 or 1 Inch to ½ Mile

Chains 80 60 40 20 0 1
Metres 1000 0 1 2
Feet 1000 0 5,000

Ministry of Natural Resources

Ontario

Ontario Geological Survey

Map 2501

HILL LAKE

TIMISKAMING DISTRICT

Scale 1:31,680 or 1 Inch to ½ Mile

Chains 80 60 40 20 0 1 2 Miles

Metres 1000 0 1 2 3 Kilometres

Feet 1000 0 5,000 10,000 Feet

SYMBOLS

- Glacial striae. Glacial fluting or drumlin.
- Esker.
- Bedrock; (small outcrop, area of outcrop).
- Bedding, horizontal.
- Bedding, top unknown; (inclined, vertical).
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- Bedding, top (arrow) from relationship of cleavage and bedding; (inclined, overturned).
- Lava flow; top (arrow) from pillows shape and packing. Lava flow; top in direction of arrow.
- Schistosity; (horizontal, inclined, vertical).
- Gneissosity; (horizontal, inclined, vertical).
- Foliation; (horizontal, inclined, vertical).
- Banding; (horizontal, inclined, vertical).
- Lineation with plunge.
- Geological boundary; (observed, position interpreted, deduced from geophysics).
- Magnetic contour value in gammas. Magnetic attraction.
- Fault; (observed, assumed). Spot indicates down throw side, arrows indicate horizontal movement.
- Lineament.
- Jointing; (horizontal, inclined, vertical).
- Drag folds with plunge.
- Anticline, syncline. with plunge.
- Drill hole; (vertical, inclined, projected vertically, projected up dip). Overburden shown.
- Vein, vein network. Width in inches, feet or metres.
- RA — Radioactivity.
- Swamp.
- Motor road. Provincial highway number encircled where applicable.
- Other road. Trail, portage, winter road.
- International or Provincial boundary.
- County, District, Regional or District Municipal Boundary, with mile post.
- Municipal Boundary, (City, Town, Improvement District, Incorporated Township), with milepost.
- Township, Indian Reserve, Meridian, Base Line, Provincial Park, with milepost, (surveyed, unsurveyed).

SAVARD

To Hwy 11

80°00'

79°55'

To Hwy 112 and Kirkland Lake

CORPORATION OF THE TOWNSHIP OF CHAMBERLAIN

CORPORATION OF THE TOWNSHIP OF

TOWN OF EMLEHART

OF EVANTUREL

OF THE TOWNSHIP

ATION

Gravel pit

47°50'

VI

V

Round Lake Batholith

Abandoned Railway

Northland

573

Derry

Hwy 11

High Falls

McLeod Lake

3000ft

Base maps derived from maps of the Forest Resources Inventory, Surveys and Mapping Branch.

Magnetic declination in the area was approximately 11°W, in 1980.

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59. Wigston, Marjorie Property
60. Williams, R. Property

Information current to December 31, 1980. Former properties on ground now open for staking are only shown if exploration data is available. A date in square brackets indicates last year of exploration activity. For further information see report.

NOTE

The typographic name "Pike Lake" is not approved by the Ontario Geographic Names Board. It is used on this map as a reference point.

8d Aplite
8f Cataclastic tonalite
8g Contaminated tonalite, diorite
8h Tonalite with mafic metavolcanic xenoliths
8j Mylonite

INTRUSIVE CONTACTS

METAMORPHOSED FELSIC TO INTERMEDIATE INTRUSIVE ROCKS

7 Unsubdivided
7a Quartz porphyry
7b Feldspar porphyry
7c Quartz-feldspar porphyry
7e Felsite
7f Carbonatized

INTRUSIVE CONTACT

1p Metamorphic layering
1q Carbonatized
1r Xenoliths of intermediate tuffaceous material
1s Epidotized mafic flows

Breccia

Ag	*Silver*
Au	*Gold*
cp	*Chalcopyrite*
Cu	*Copper*
fu	*Fuchsite*
hem	*Hematite*
qcv	*Quartz carbonate vein*
qv	*Quartz vein*
ra	*Radioactive minerals*
S	*Sulphide mineralization*

[a] *Unconsolidated deposits. Cenozoic deposits are represented by the lighter coloured and uncoloured parts of the map.*

[b] *Bedrock geology. Outcrops and inferred extensions of each rock unit are shown respectively in deep and light tones of the same colour. Where in places a formation is too narrow to show colour and must be represented in black, a short black bar appears in the appropriate block.*

[c] *Stratigraphic position is not implied by lithologic position in the legend.*

The letter "G" preceding a rock unit number, for example "G 13" indicates interpretation from geophysical data.

Anticline, syncline, with plunge.

Drill hole; (vertical, inclined, projected vertically, projected up dip) Overburden shown.

Vein, vein network. Width in inches, feet or metres.

RA *Radioactivity.*

Swamp.

Motor road. Provincial highway number encircled where applicable.

Other road. Trail, portage, winter road.

International or Provincial boundary.

County, District, Regional or District Municipal Boundary, with mile post.

Municipal Boundary, (City, Town, Improvement District, Incorporated Township), with milepost.

Township, Indian Reserve, Meridian, Base Line, Provincial Park, with milepost, (surveyed, unsurveyed)

Mining property, surveyed. Mineral deposit or mining property, unsurveyed.

Surveyed line. Unsurveyed line.

All boundary and survey lines are approximate position only.

Some symbols may not occur on this map.

80°15'

80°10'

47°45'

TRUAX

THE TOWNSHIP OF JAMES

SMYTH

Driftwood Creek

Tamarac Creek

Tamarac Lake

Tud Lake

Honeymoon Lake

Honeymoon Creek

Mount MacDonald

Gravel pits

Trench

To Hwy 65 and Elk Lake

Adjoins Map 2151

ate tuffa-

posits are
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colour and
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Anticline, syncline, with plunge.

Drill hole; (vertical, inclined, projected vertically, projected up dip). Overburden shown.

Vein, vein network. Width in inches, feet or metres.

RA — Radioactivity.

Swamp.

Motor road. Provincial highway number encircled where applicable.

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VI — Municipal Boundary, (City, Town, Improvement District, Incorporated Township), with milepost.

VI — Township, Indian Reserve, Meridian, Base Line, Provincial Park, with milepost, (surveyed, unsurveyed).

2 ① — Mining property, surveyed. Mineral deposit or mining property, unsurveyed.

Surveyed line.
Unsurveyed line.

All boundary and survey lines are approximate position only.

Some symbols may not occur on this map.

80°10'

Tamarac

Mount MacDonald

Gravel pits

Trench

Lake

McLeod Lake

Sunday

Hill Lake

Fish rearing station

Gravel pit

Possible Middle Precambrian Sediments

Honeymoon Lake

Honeymoon Creek

Cross

5 4 3 2 1 12 11 10

McLeod Lake

Sunday

Hill Lake

Fish rearing station

Gravel pit

Possible Middle Precambrian Sediments

Cross Lake

Timiskaming West Shore Fault

Dunbar Rock

Ash's Rock Gravel pit

Gravel pit

BEAUCHAMP

THE TOWNSHIP OF ARMSTRONG

CORPORATION OF THE TOWNSHIP

To Hwy 11

To Earlton

47°45'

TOWNSHIP OF JAMES

TOWNSHIP OF THE CORPORATION OF THE

Adjoins Map 2151

To Elk Lake

TUDHOPE

BARBER

Tamarac Lake

Twin Lake

Tud Lake

Hope Lake

Lake

Stock

Elk Lake

Webun Creek

Honeymoon Lake

Honeymoon Creek

Sunday Creek

Heather Lake

Potential for Middle Precambrian Sediments

Ontario Northland Railway

Montreal River

To New Liskeard

47°40'

80°15'

80°10'

Published 1985

Hill Lake

Hill Lake

Fish rearing station

Gravel pit

Possible Middle Precambrian Sediments

Cross Lake Fault

Gravel pit

Honeymoon Lake

Honeymoon Creek

Trench Shaft

Trench Au

Sunday Creek

Heather Lake

Pike Lake

BRYCE

Callicut Lake

Lost Lake

Bailey Lake

Echo Lake

Possible Middle Precambrian Sediments

To Hwy 65

CANE

To Hwy 65

80°05'

80°00'

Hill Lake

Fish rearing station

Gravel pit

Possible Middle Precambrian Sediments

Cross Lake Fault

Timiskaming West Shore Fault

Callicut Lake

Lost Lake

Bailey Lake

Echo Lake

Possible Middle Precambrian Sediments

Gravel pit

Baptiste Creek

St Jean

BEAUCHAMP

HENWOOD

THE TOWNSHIP OF ARMSTRONG

CORPORATION OF

To Hwy 11

To Earlton

To Hwy 640

To Hwy 65

To Hwy 11

To Hwy 65

47°40'

80°00'

Adjoins Map 2126

79°55'